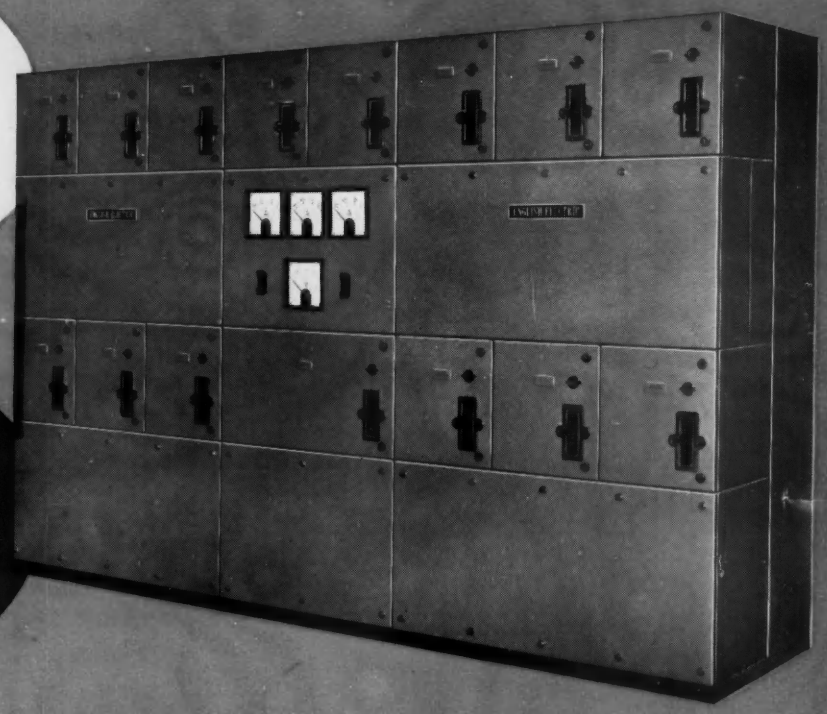
29 JULY 1954 NINEPENCE

ELECTRICAL TIMES

'Superform' fuse switchboards



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MEDIUM VOLTAGE CIRCUITS.

Incorporating
H.R.C. CHASSIS TYPE FUSE-SWITCHES
in ratings up to 750 amps.

MODERN STYLING: Easy-to-clean, smooth, flush contour. Retractable switch-operating handles.

SAFETY FEATURES: Busbars, connections and terminals fully insulated. Potential circuits fused at supply point. Integral cylinder locks fitted to fuse-switches.

PERFORMANCE: Fuse-switches proved for making capacity on 50 MVA at 440 volts, 3 phase, 50 cycles.

ACCESSIBILITY: Hinged instrument panels give ready access to instruments, terminal boards and small wiring.

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Fusegear Works, East Lancashire Road, Liverpool, 10
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
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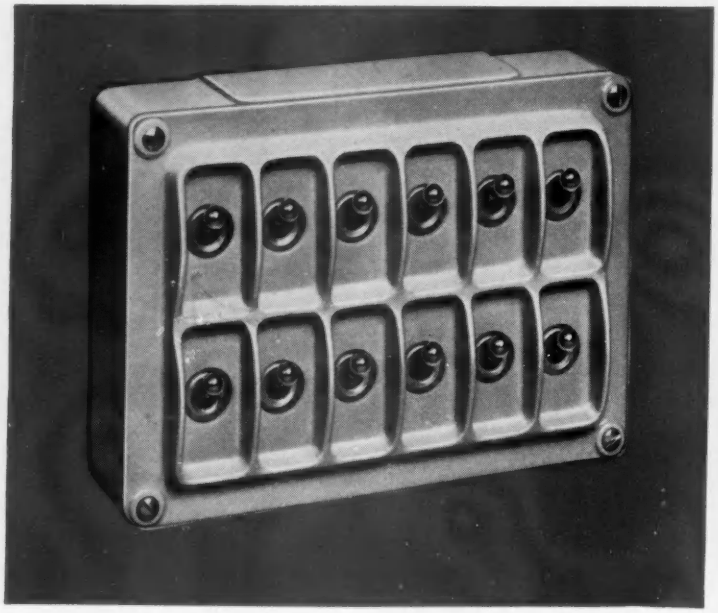

IRONCLAD SWITCH ASSEMBLIES made by the house of **Simplex**

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Simplex Electric Co Ltd of Oldbury Birmingham

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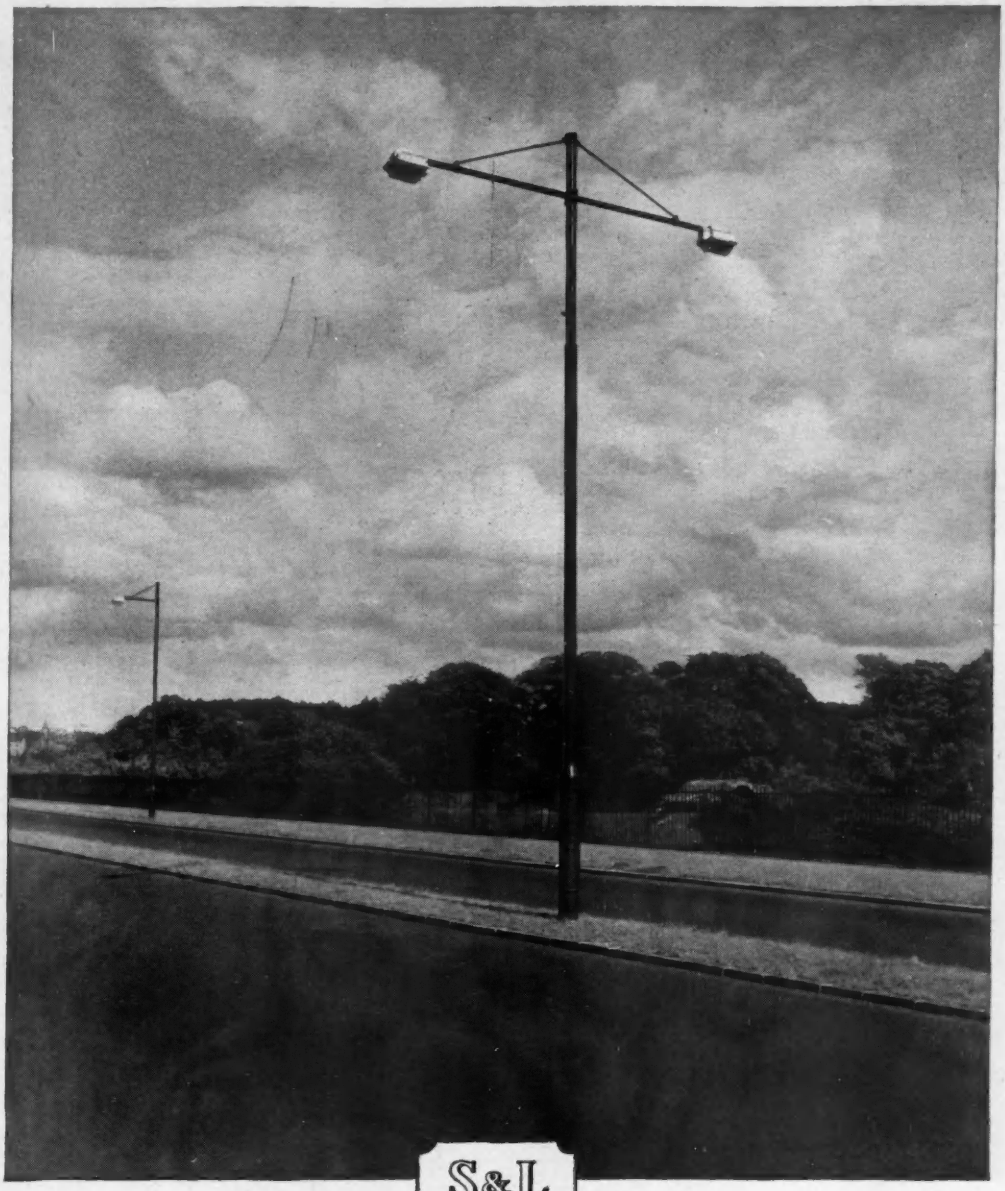


S&L

TUBULAR STEEL LIGHTING COLUMNS

25 ft. M.H. for Group 'A' Roads

SUITABLE FOR ELECTRIC LIGHTING

This is one of a series of illustrations indicating our range of tubular steel lighting columns in accordance with B.S. 1840. It shows single and double bracket arm columns, types Gb. 503 and Gb. 557, erected by the County Council of Lanark. Other designs, plain or fluted, for 13 ft., 15 ft., and 25 ft. mounting heights, will appear from time to time. A folder showing our standard columns will be sent on application.

STEWARTS AND LLOYDS LIMITED

GLASGOW · BIRMINGHAM · LONDON

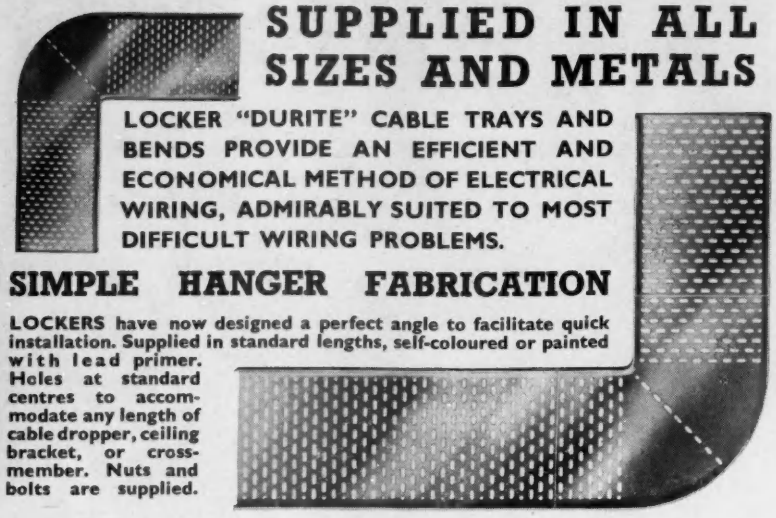
The largest manufacturers of steel tubes in Europe

A

Locker "Durite"

CABLE TRAYS & BENDS

SUPPLIED IN ALL SIZES AND METALS



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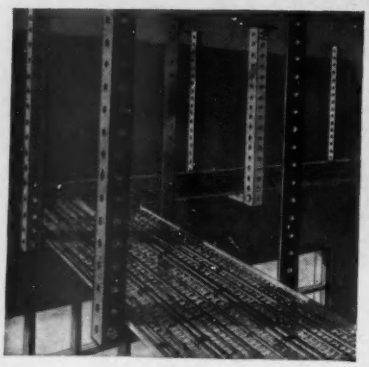

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A subsidiary of Thomas Locker & Company Ltd.
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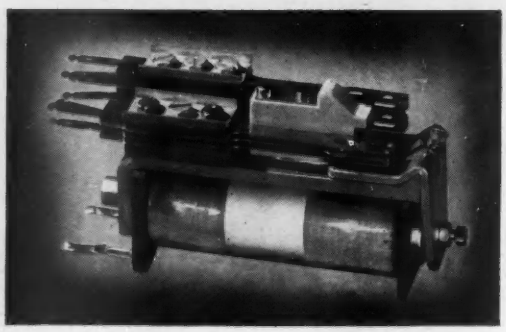
STEVENAGE RELAYS LTD



- Manufacturers of **Type 3,000** relays with contacts and windings to customers requirements.
- Designers of relays to meet special requirements.
- No used or second hand materials employed.

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Grosvenor 1716

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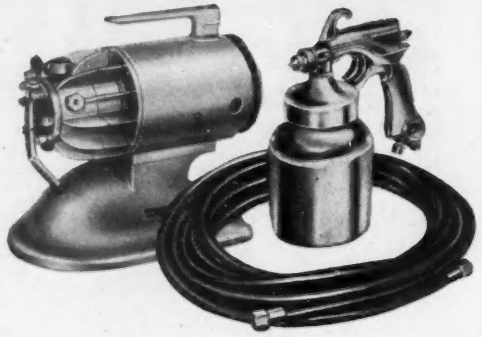

A small, compact and ultra-lightweight unit that will spray almost any medium at speeds up to one square yard per minute. The equipment comprises: A powerful, sliding vane, automatically lubricated **Compressor.** A lightweight "bleed" type **Gun** with a quart size **Paint Jar.** All necessary **Hoses** and **Connections,** bottle of special oil, funnel, set of tools and alternative nozzle.

Weight complete about 22 lb. Standard voltages 110, 200/220, 230/250. Special voltages to order.

A pressure feed Container with equipment is available as an extra.

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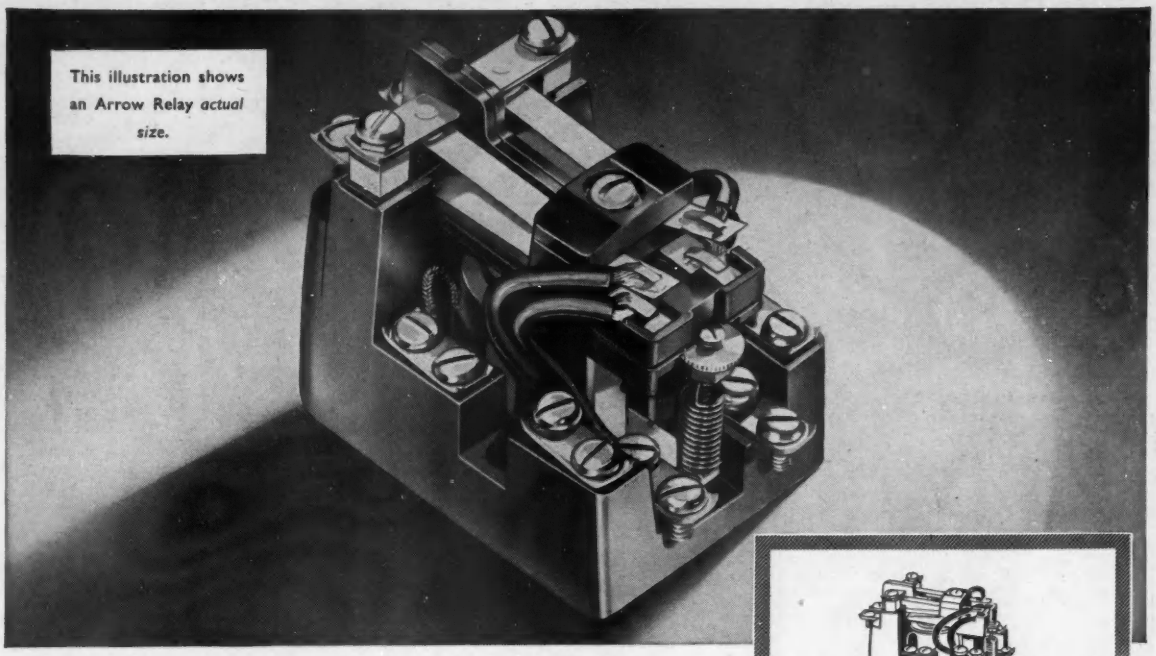

This illustration shows an Arrow Relay *actual size.*

Made by skilled craftsmen from first-quality materials, Arrow Relays, like all Arrow products, are individually produced; they are designed and built to ensure exceptionally long and silent service.

Essentially compact, no less than thirty different circuit arrangements are available on the standard base. Silver-to-silver butt type contacts give continuous rating up to 10 amps per pole at 230 volts AC. Operating coils, of low wattage consumption and continuously rated, are available for 6 to 550 volts AC and 6 to 230 volts DC.

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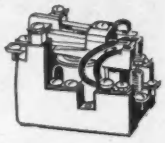
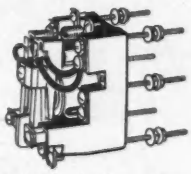
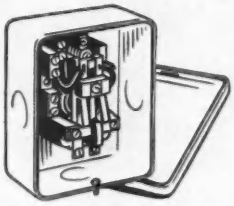


1. For surface mounting



2. For back of panel wiring



3. Enclosed

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N C S

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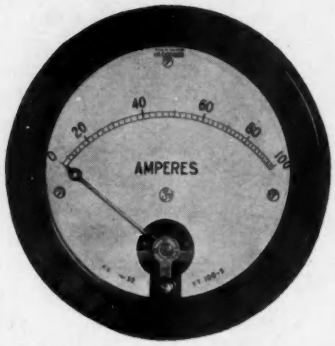
N.C.S. FREQUENCY METER



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N.C.S. ROTARY SYNCHROSCOPE

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SUPPLY SWITCHES

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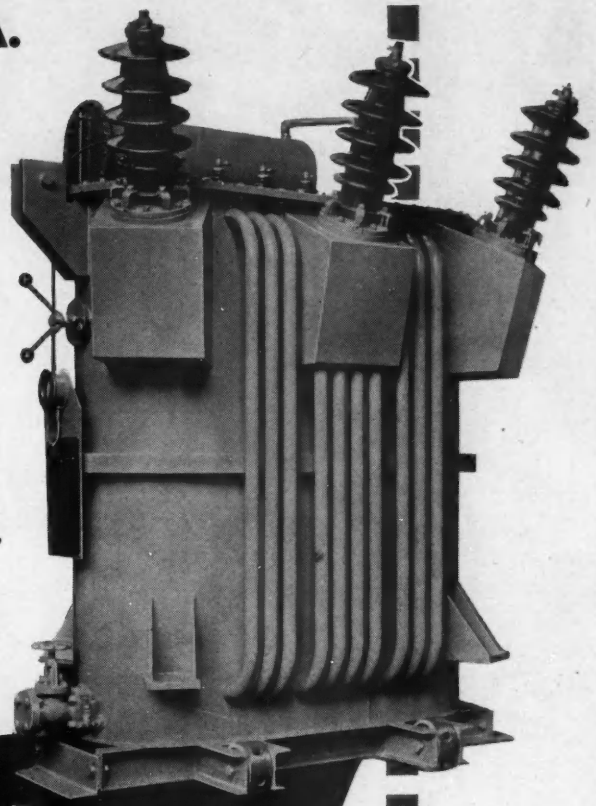

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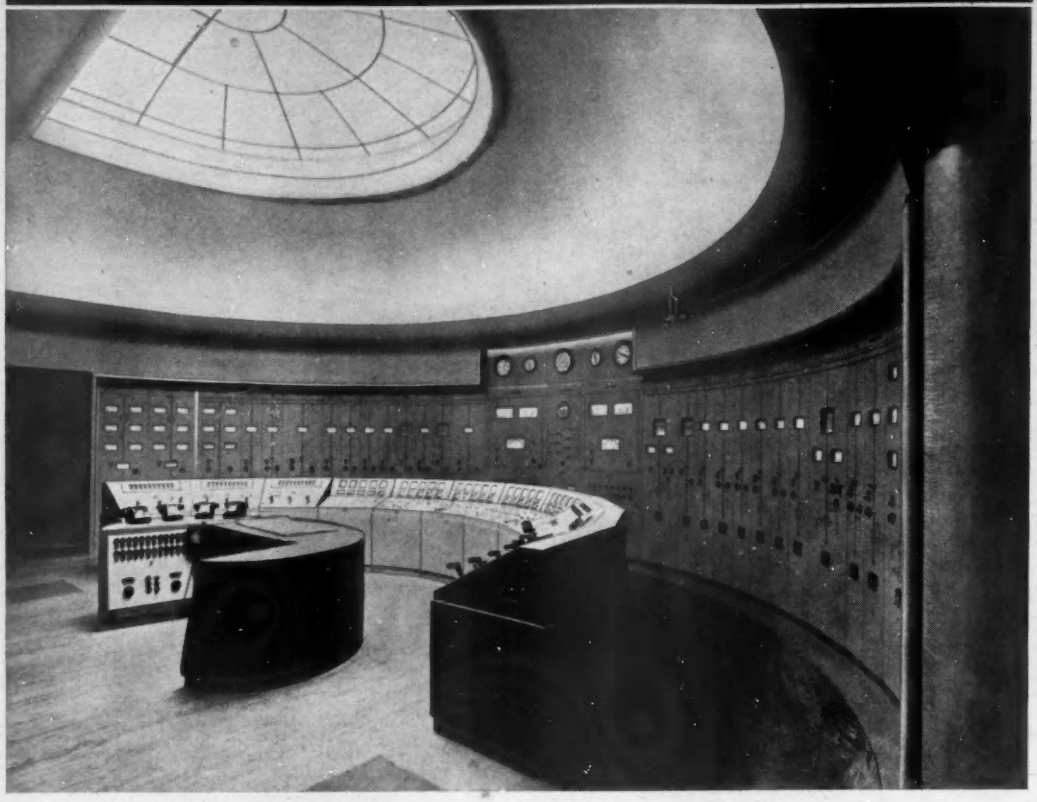

Power-station corridor-type control-board for generators, transformers, and feeders, with generator control-desk and control-engineer's logging-desk in the foreground

specialists in switchgear and control-apparatus

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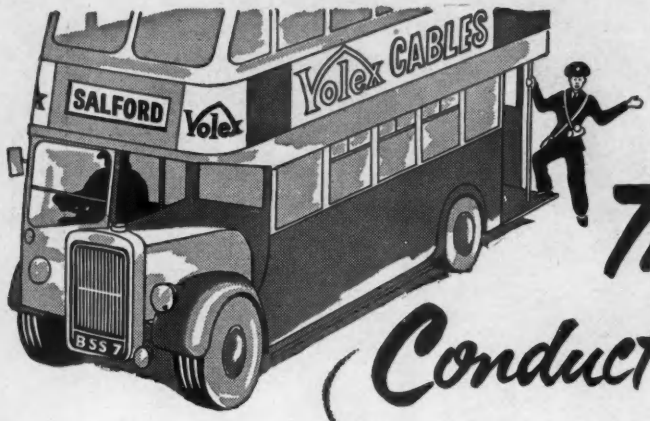

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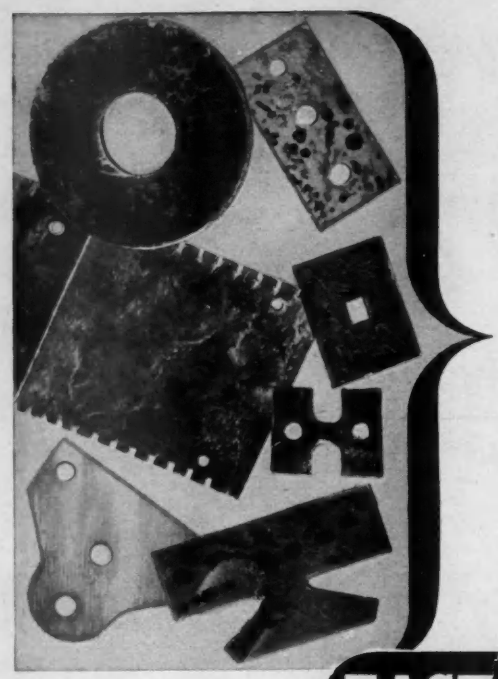

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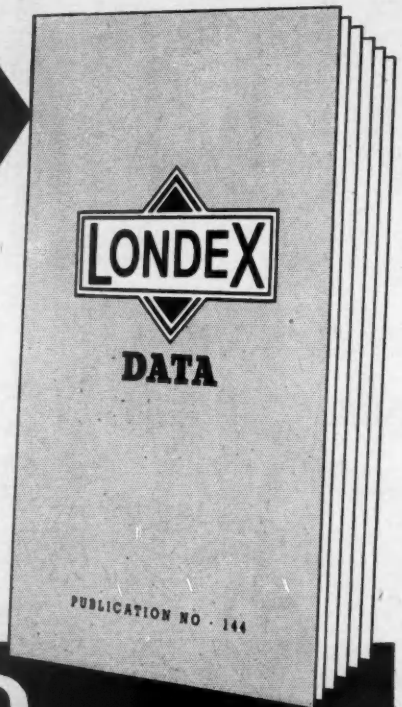

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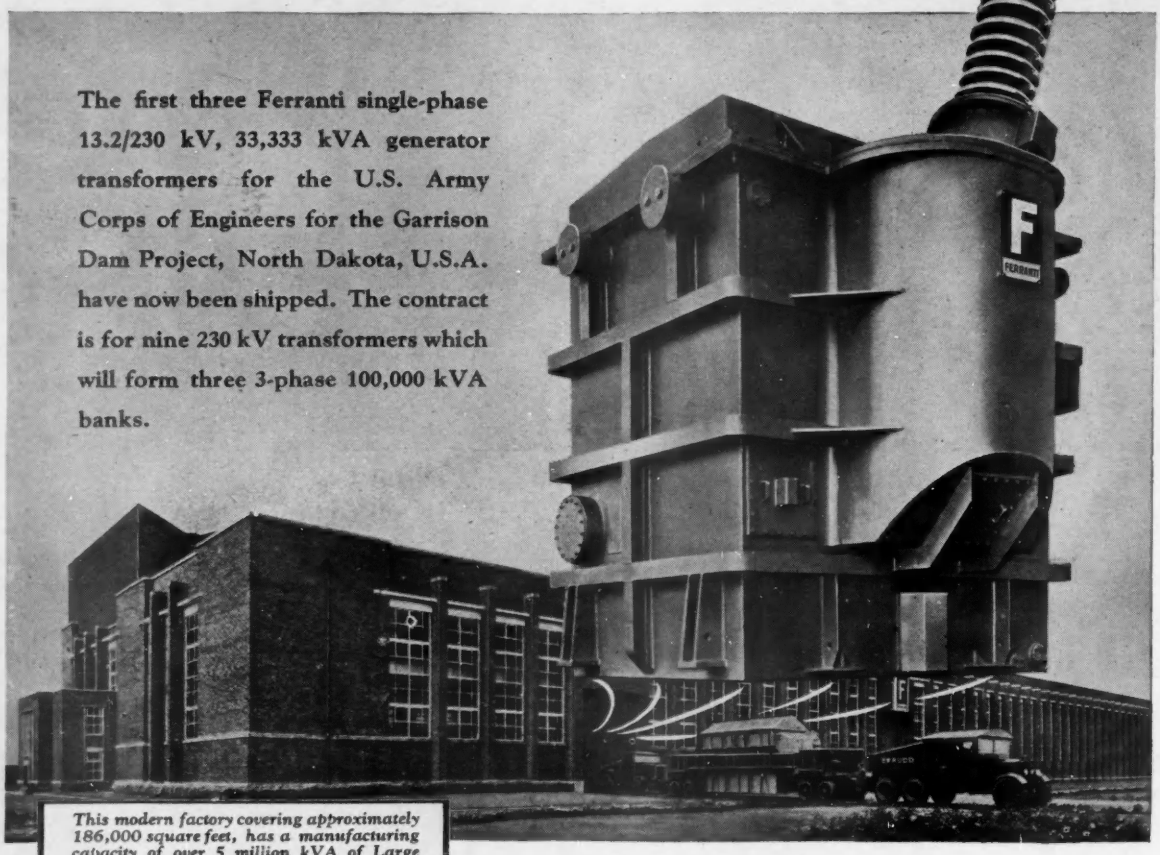

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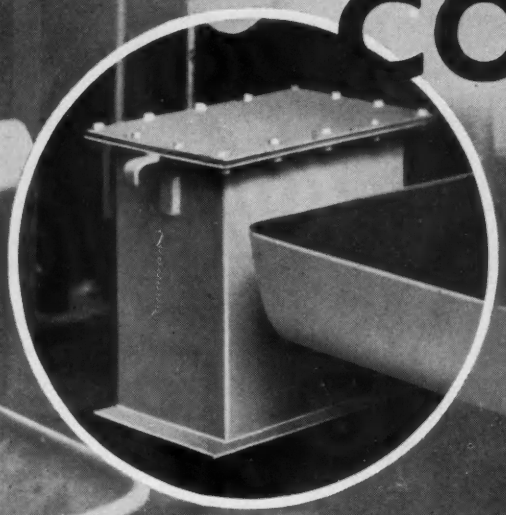

This 5-kVAr Capacitor corrects the power factor of a 15 h.p. motor on a machine tool.

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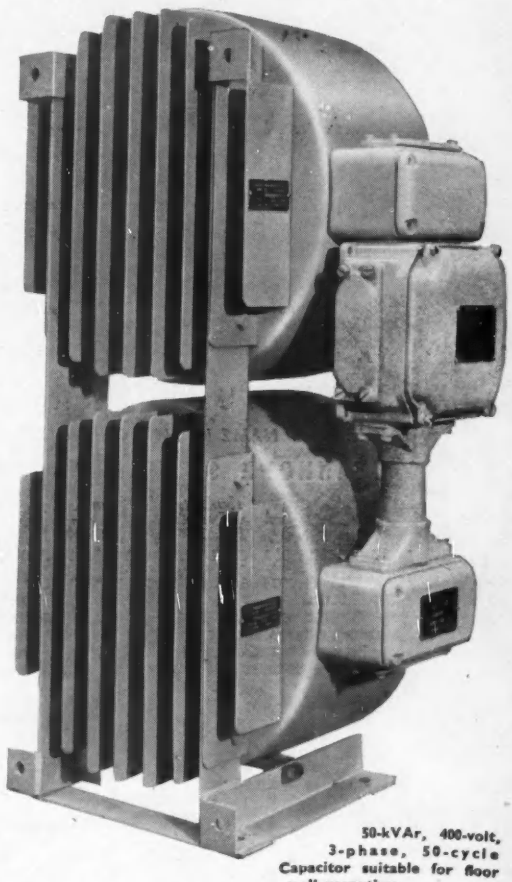
WRITE FOR LITERATURE OUTLINING THE ADVANTAGES OF INSTALLING ASEA CAPACITORS.



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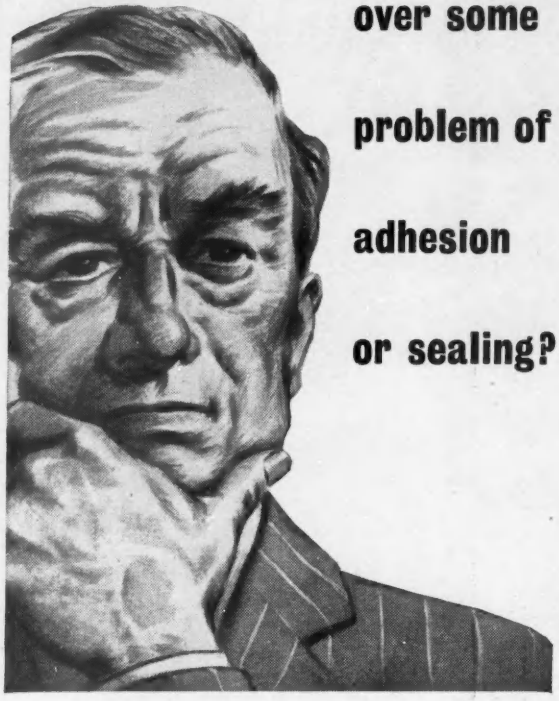
Who has a headache



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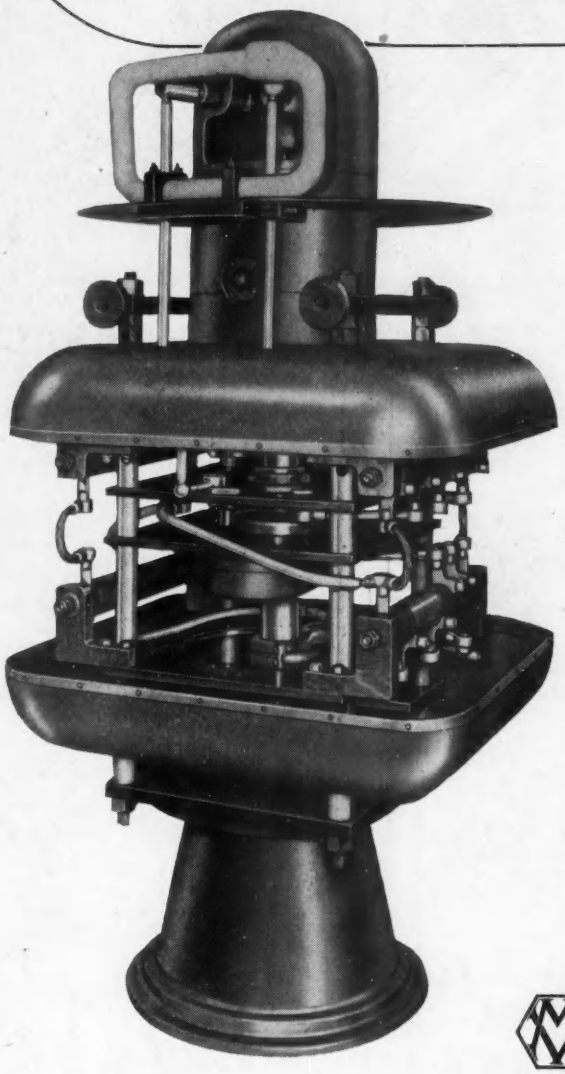

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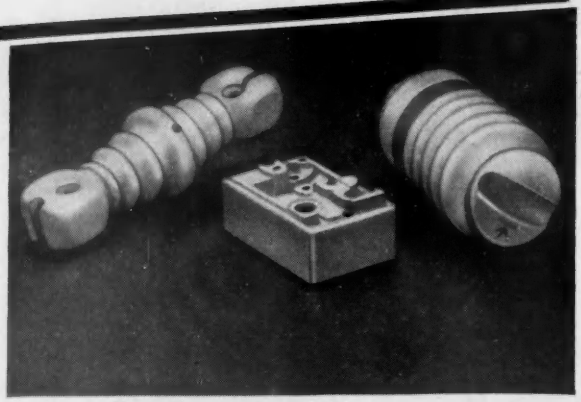

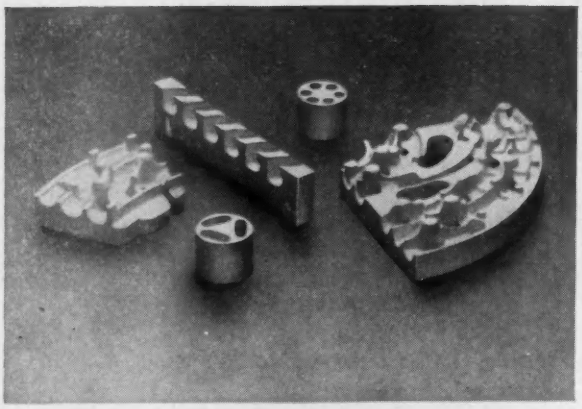

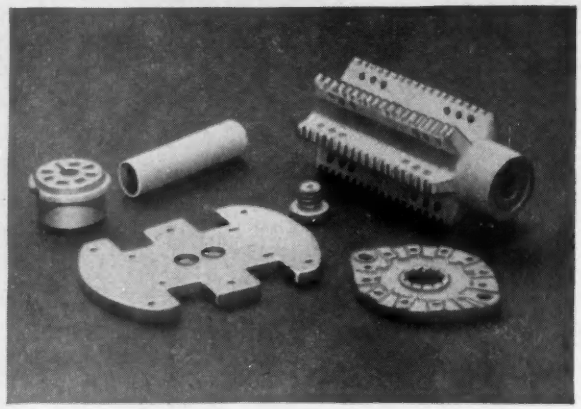

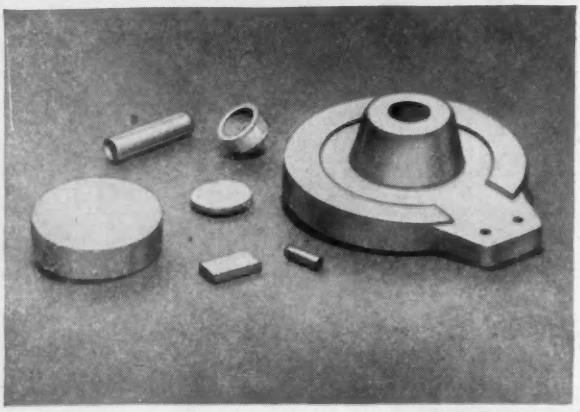

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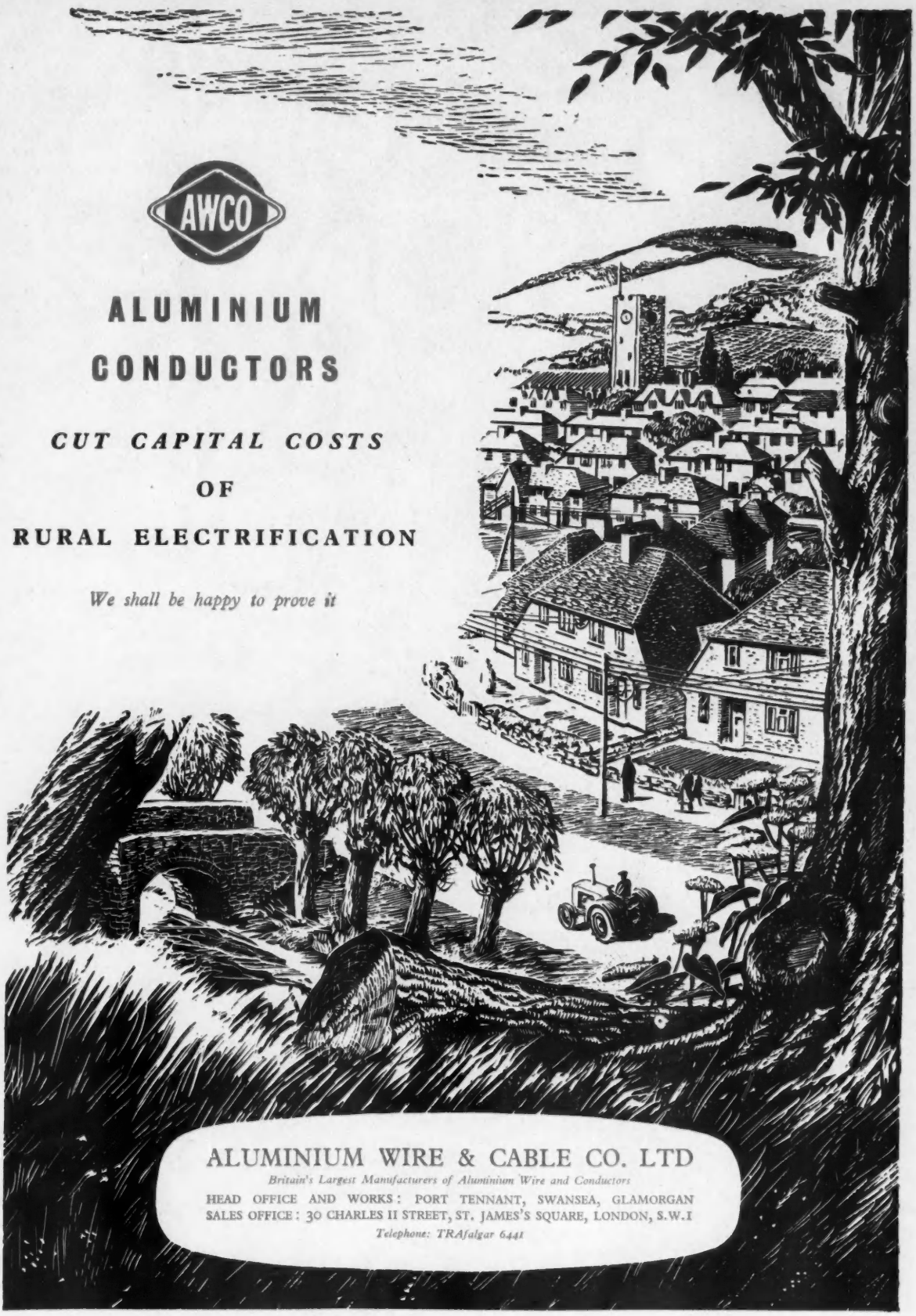

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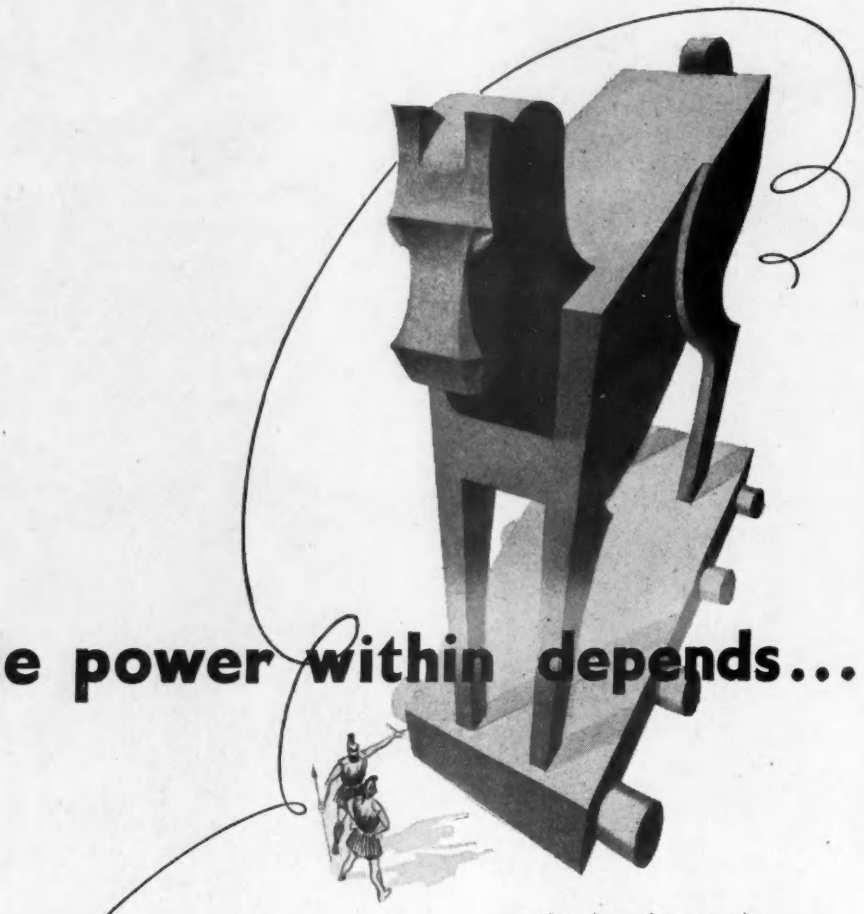

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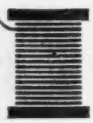

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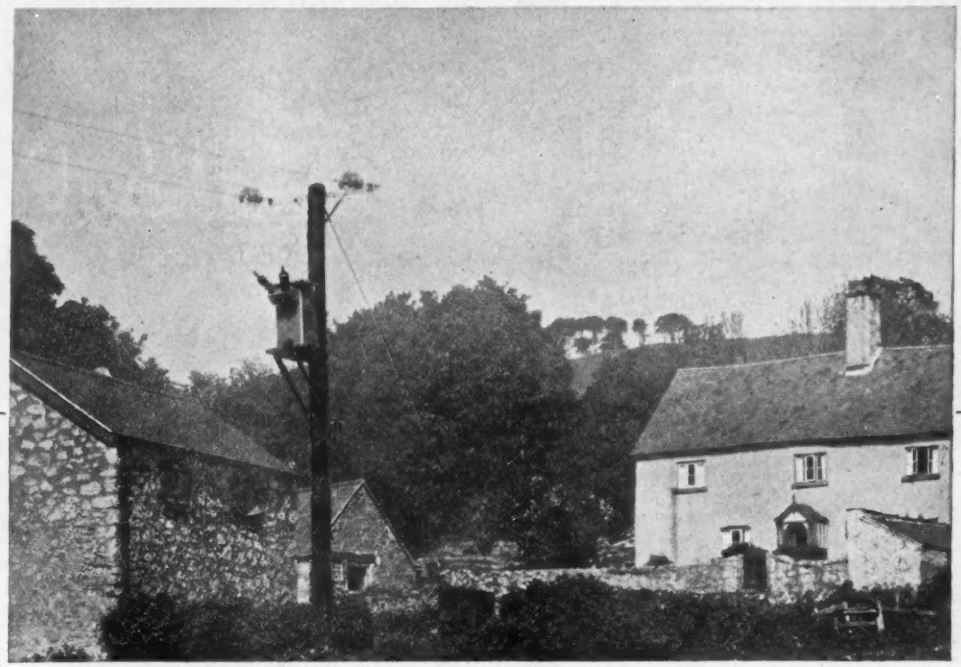

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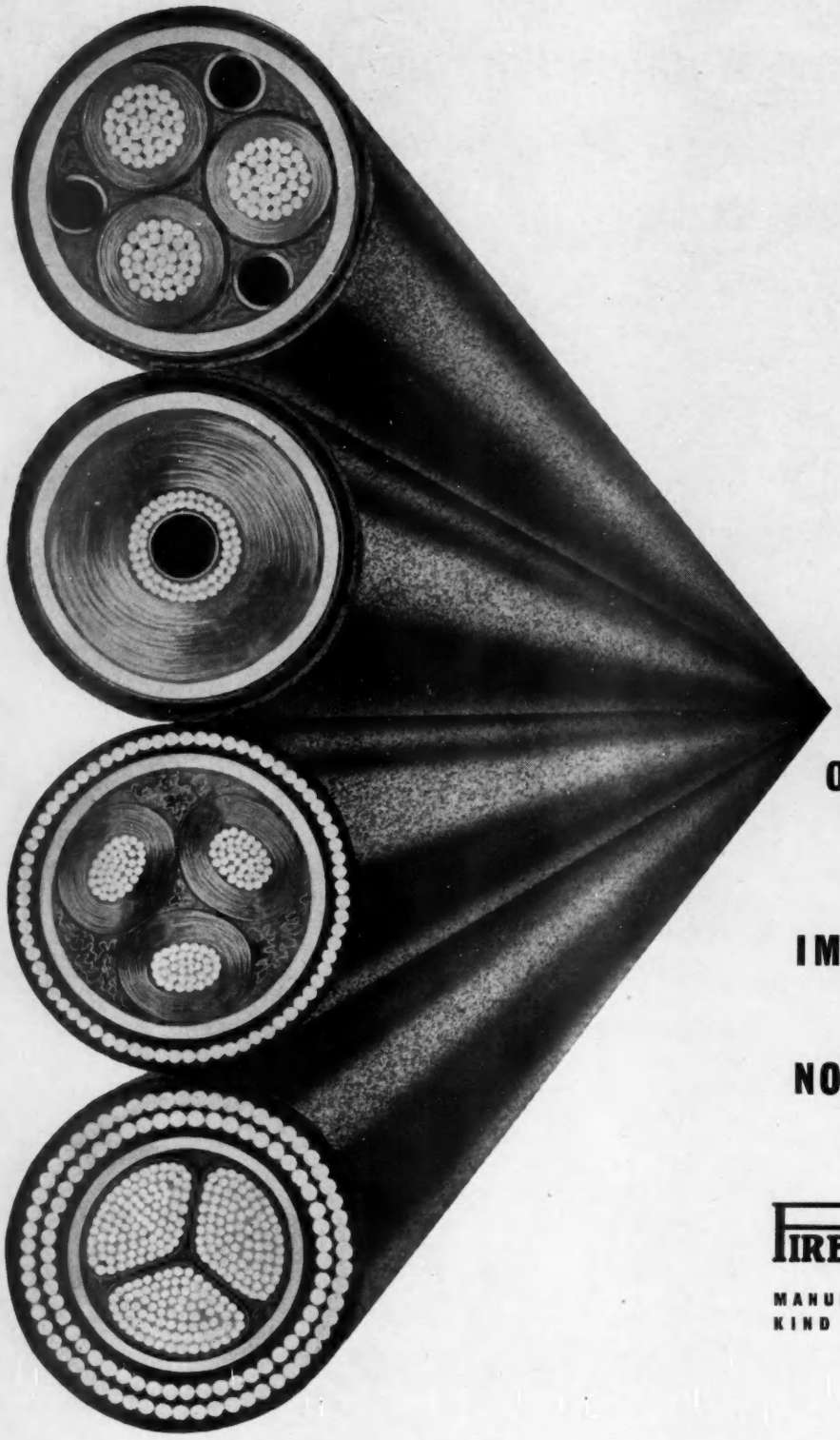

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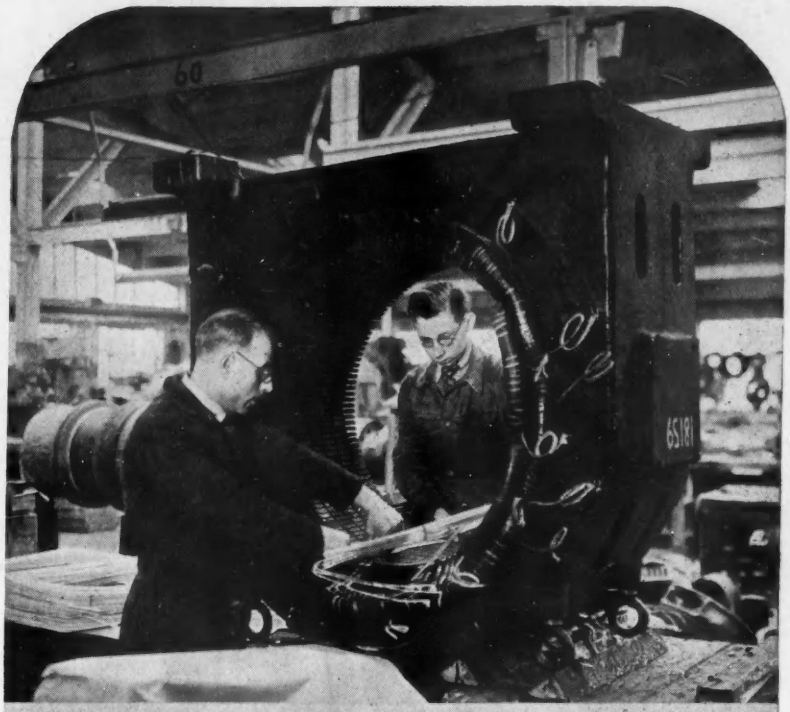

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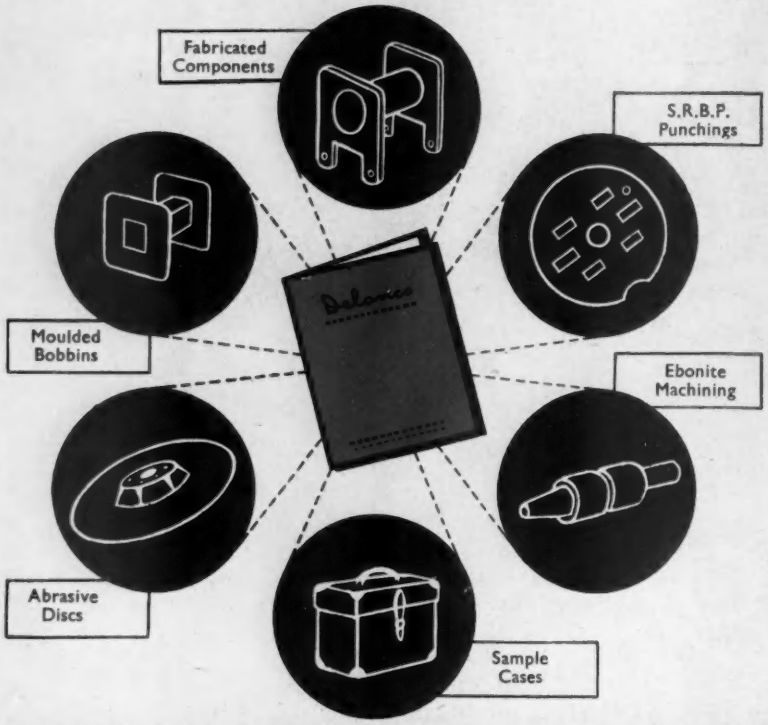

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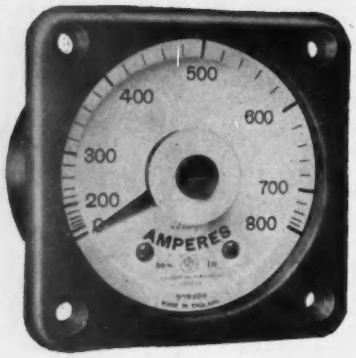

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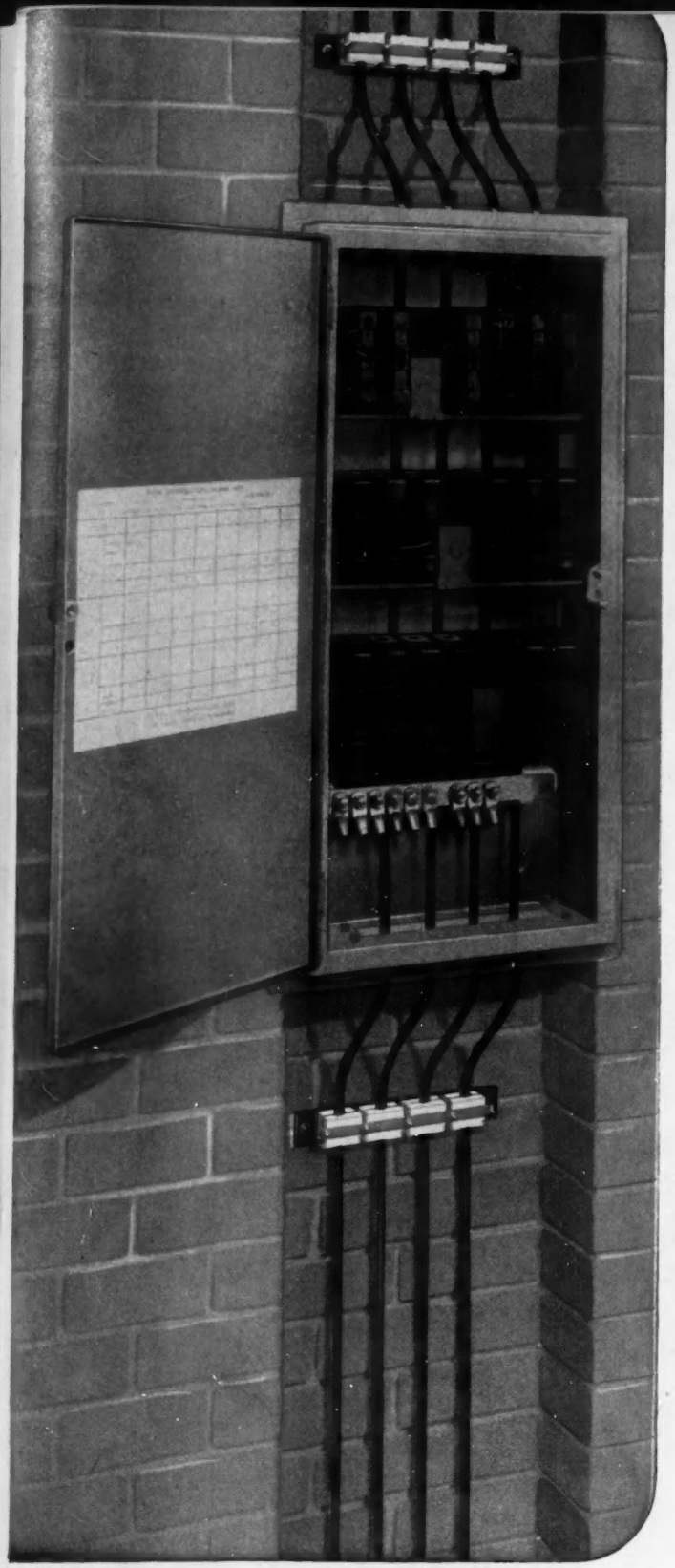

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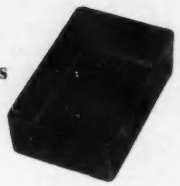

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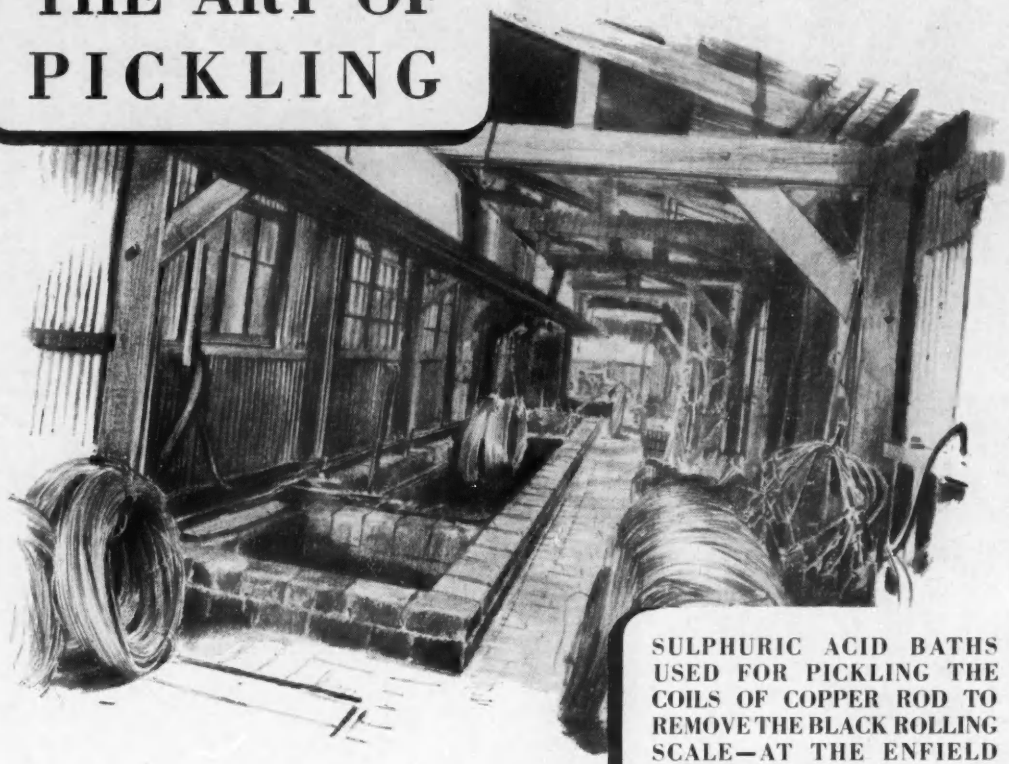

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ESTABLISHED 1891

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PEAT AND POWER

The recent international peat symposium held most appropriately in Eire has served to emphasise the attention now being paid to exploitation of this fuel. Efforts have long been made, with good success, to burn sod peat on modified chain grates, and such a method is now in use at the Portarlington and Allenwood stations of the Eire Electricity Supply Board. But it is in the gas turbine field that peat is proving most attractive. The high temperature of the waste heat in the turbine exhaust, may profitably be used for drying the raw fuel—a considerable contribution to the overall efficiency of the plant, which, according to one speaker may be 25% with small closed circuit units of 2 MW, rising to over 30% with machines in the 15-20 MW range. Such efficiencies are directly comparable with the present steam turbines of similar size. When in addition the increasing price and decreasing availability of coal are taken into account, the existence in Europe alone of over 84,000 million tons of combustible peat is a challenge to the fuel technologist. Unfortunately, peat is expensive to transport, and should in consequence be burnt as near to its place of origin as possible. Here, again, the gas turbine, with its light weight and limited need for auxiliary plant, can be transported and erected without serious difficulty on remote sites, and in consequence it may become a major factor in bringing electricity to sparsely populated areas. Perhaps even more important is the resulting reconditioning of the land to agricultural use by removal of the peat overburden, achieving with it a rehabilitation of the peat areas.

SOLID FUEL RETAINS ITS LAURELS

It is some years now since it was suggested in these columns that the modern open improved grate was not all that its supporters claimed. Whatever its performance burning coke may be, by far the greater proportion of grates are used with bituminous coal and under such conditions its performance is no better than that of the old stool bottomed grate. Since then official recognition of this was made in the report of Fuel Research Board 1952, a conclusion based on laboratory tests. Now further confirmation is available in the 1953 Building Research Report, published last week. This records a study on twenty-four local authority houses when stool bottomed grates were replaced by the so-called improved type. The report states that "on the average no considerable change, either in consumption or in temperatures maintained, took place." When one considers the storm of propaganda that was released by advocates of these grates in

the past, and the wild statements that were allowed to go unchallenged, one can only marvel at the present calm manner with which these later findings are accepted. Or is it felt by the advocates of solid fuel that the battle has been decisively won. Certainly as far as the general public is concerned these grates are commonly accepted as saving fuel and the people will go on believing so, as it is not etiquette for the other fuel industries to decry competing equipment. Yes, there is every reason for the advocates of solid fuel to rest on their laurels.

TOWARDS FUEL EFFICIENCY

Everyone will wish success to the National Industrial Fuel Efficiency Service in its aim to save the nine million tons of coal estimated by the Pilkington Committee as wasted due to inefficient use of heat in industry. With the possibility of saving 20% on fuel bills in most firms, the Service would seem to have a relatively easy task but experience has shown how difficult it is to obtain enthusiasm from firms whose fuel charges are an insignificant proportion of total costs. The excellence of the Ministry of Fuel's campaign in its heyday during the war, was effective only within the limits of co-operation it received from industry, but perhaps economic factors are more propitious for success today. None the less the Service will have to face an uphill fight in publicity and one of its most powerful new weapons will be its ability to recommend government loans up to £30,000 free of interest for the first two years, which taken together with the new tax concessions, offers most reasonable conditions for financing improvements in heat systems. The activities of N.I.F.E.S., as the Service likes to be called, includes the survey of the electrical installations from the economy point of view but this is likely to be a most circumscribed field of activity. The electrical side may have greater significance where recommendations on the installation of pass-out turbines are made but the number of suitable factories is unlikely to be such as to call for considerable staff reinforcement, neither will the £30,000 loan limit go far on such plant.

ENCOURAGING MECHANISATION

The restoration of discretionary entry of machinery duty free into the country is a step that would be welcomed by industry and the favourable report last week by the Board of Trade committee considering this matter brings this possibility considerably nearer. The Government has shown itself sympathetic to increasing mechanisation in industry, and with half a promise on this question of duty-free imports, it will be surprising if at least some of the recommendations are not implemented. The full effect on any relaxations are not easy to assess since when the duty was imposed in 1952, long delivery dates were still playing a part in capital re-equipment of industry. The position is easier today but there will remain the restriction on dollar imports even though the dollar balance is less pressing than in 1952. As the proposed concession will relate only to machinery not readily procurable in this country it will have little effect on the electrical industry as a whole, for the duty-free electrical imports in 1951 amounted to no more than 0·7% of the total, one of the principal sections to benefit being users of lamp and valve making machinery. However, any step which increases mechanisation in industry correspondingly improves electricity consumption and the electrical industry would have to be largely content with this as a consolation prize.

SUPER-TENSION CABLES

Since the advent of the oil-filled cable opened up a new field of design for super-tension installations several new cable types have been produced, each with their special characteristics, construction techniques and operational factors. It is for this reason we reproduce in this issue a summary of the different cables which are available today. Through the development of these new designs and by the continuation and painstaking improvements in manufacturing techniques a stage has been reached where manufacturers have expressed their confidence not only to produce cables for operation at 275 kV, but satisfactorily to manufacture submarine cables for that voltage, with all the added complication that such a type of cable implies. New materials, also, are entering the cable field, and their possibilities are being explored. Cable design is therefore, facing up to the realities of this super-tension era, even though applications in this voltage range are necessarily limited on economic grounds.

TIME FOR CLOCKS

Sales of electric clocks are climbing once more. True, deliveries have not yet passed the former peak, but there is every sign that the public have regained their faith in the time keeping qualities of electricity supply and believe that even if there is an occasional loss of a minute or two at times of peak load, this is amply compensated for by the accurate time keeping throughout the year. But if clock sales are rising, this appears in the main due to the activities of the jewellery trade rather than electrical retailers, for the public prefer to go to the watch repairer for their electric clocks. Electrical retailers have perhaps been insufficiently energetic in encouraging sales, and in impressing the public that these clocks are electrical appliances rather than a modern form of conventional timepiece. Neither does the trade generally carry sufficient stocks to whet the appetite of a customer seeking an object to be given pride of place on the mantelshelf. Clocks also might be a means of introduction to a wiring job. Too often, the purchaser is left to connect the clock himself with a dangling length of flex from the nearest plug point, a flex which will be continuously energised with mains voltage! The electrical industry does far too little wiring for clocks, which should have their own special plug close to hand. How few of the electrical installations in new houses make provision for clock outlets, yet the time is not far off when electric clocks will be as common as wireless sets in the home.

Meteor

British Developments in Cable Manufacture

A Survey of Progress in Design and Construction of Power Cables of all Types made in Great Britain*

By D. T. HOLLINGSWORTH, M.I.E.E.

PRIOR to 1926, the supply of electricity in Great Britain was mainly local. Power stations were usually situated in the towns or cities they served, and distribution was largely by underground cable. Distances were relatively short, and voltages in excess of 22 kV were seldom used before 1920. However, the growing demand for electric power necessitated the use of higher voltages and by 1923 over 125 miles of 33 kV cable were installed. Below are shown, in Figs. 1 and 2, two early examples of high voltage power supply cables. The Ferranti cable (Fig. 2) was enclosed in iron pipes, but Fig. 1 shows a later type with lead sheath.

The establishment of the Grid meant that transmission became mainly by overhead lines at 132 kV with secondary voltages of 66 and 33 kV but some cables were required, for example, in urban centres, and their design and manufacture for voltages in excess of 33 kV presented a fresh set of problems to the cable industry. The successful solution of these problems is indicated by the figures in Table I, of lengths of overhead line and cable routes respectively in use in the Grid at 1952. The figures given for 66 kV include a negligible percentage of 33 kV routes.

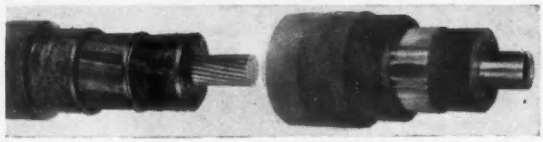


Fig. 1. Prescot 10 kV lead sheathed cable (1896). On right, Fig. 2, Ferranti 10 kV tubular main (1889), (¼ full size)

Fig. 3 shows the demand for electric power between 1920 and 1952. Superimposed is an approximate representation of the volume of production of insulated wires and cables for power applications in Great Britain. It will be seen that the use of electric power has increased much more rapidly than the output of cable. Many factors, including the general use of overhead transmission lines, will have contributed to this, but it may not be unreasonable to infer that they include the more economical use of materials by the industry.

Solid Type Cables

Prior to 1920, reliable paper insulated cables of the belted type had been used for operation at 22 kV, with a maximum radial stress of approximately 20 kV/cm. The insulation thickness had been largely determined by mechanical considerations and the potentialities and limitations of this type of insulation had not been fully explored.

With the general use of 33 kV transmission from 1920 onwards, it became necessary to use the paper insulation as efficiently as possible to keep the cost of the cable to a minimum. Belted cables were made for 33 kV, using a higher maximum radial stress than previously, a value of 26 kV/cm being typical.

TABLE I.—LENGTHS OF OVERHEAD LINE AND UNDERGROUND CABLE IN THE NATIONAL GRID AT 1952

Route Miles:	At 132 kV	At 66 kV	Total
Overhead lines ...	4,040	155	4,195
Underground cables...	62	340	402
Total	4,102	495	4,597
Percentage of cable ...	1·5%	69%	8·8%

However, although a few solid type 33 kV belted cables are still in operation, the design was not satisfactory and failures occurred in service. Cable of this type is illustrated in Fig. 4.

The problem was not solved until core screening, on the basis of the Hochstadter patent of 1914, was introduced. Two types of cable were developed for 33 kV use:

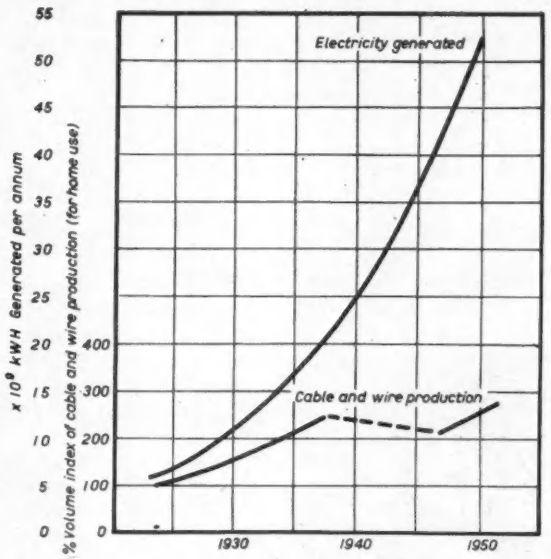


Fig. 3. Generation of electricity in Gt. Britain (kWh/annum) and percentage volume index of cable and wire production for home use (excluding telecommunications)

**This article is a digest of a paper prepared by Mr Hollingsworth and presented on behalf of the Cable Makers' Association. Mr Hollingsworth is Chief Engineer of British Insulated Callenders Cables Ltd.*

the "H" type with individual cores screened with a metallised paper or metal tape, and the H.S.L. type with each insulated core separately lead sheathed. These types are illustrated in figures 5(*b*) and 5(*a*) respectively. With increased experience of screened cores, cables for use at higher operating voltages were developed. Single core 66 kV cables were made and installed in appreciable lengths from 1929 onwards. Some troubles were experienced, but with improvements in materials and manufacturing processes, it was found that solid type cables could be used for 66 kV.

An attempt was made to improve the performance of 66 kV solid type cable by using strand of oval cross section

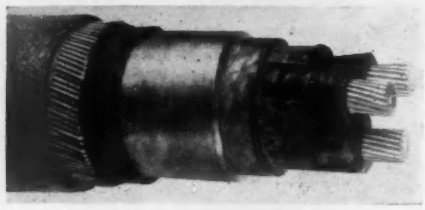


Fig. 4. A 33 kV belted cable (about 1920). (¼ full size)

with a corresponding dielectric shape, which tends to become circular with thermal expansion. By this means accommodation is provided within the dielectric for the increased volume of compound when hot. Since 1930 there have been a number of successful installations of cables of this type, but their use has now been largely superseded by other types. A typical 66 kV single core oval strand cable is illustrated in Fig. 6.

Extensive research on solid type cables led to a better understanding of the mechanism of breakdown at increased dielectric stress. It became apparent that limitations are imposed by the formation of voids in the dielectric as a result of cyclic thermal expansion and contraction of the impregnating compound, caused by varying loads. Ionisation of gas in these voids can lead to ultimate failure of the insulation, if relatively low values of stress and conductor temperature are exceeded. Typical limiting values are approximately 45 kV/cm and 65° C respectively, and it is now recognised that 66 kV represents approximately an upper limit of working voltage for cables of this type.

Pressurised Cables

The need for 132 kV cables in the Grid, and the limitations of solid type cables made it necessary to seek for new design principles, which would permit the use of substantially higher dielectric stresses. A new fundamental principle was evolved in which the difficulties, arising from thermal expansion and contraction, were obviated by use of a fluid under pressure.

This principle was first applied successfully by Emanueli who patented, in 1917, a cable with an oil duct at the centre of the strand, as illustrated in Fig. 7. Cables of this type have a paper dielectric impregnated with a low viscosity oil, and the duct is connected to oil reservoirs, arranged to maintain a pressure sufficient to ensure freedom from voids under normal operating conditions. The same fundamental principle, namely the use of a fluid under pressure in the cable, was described by Fisher and Atkinson in their patent of 1925. In this case, however, air at a pressure sufficiently high to prevent ionisation, and used in conjunction with a dry paper dielectric, was given as the preferred form of construction. The use of other gases and impregnated dielectrics, was also referred to. A further modification of this principle was embodied in Hochstadter's patent of 1926 which describes a cable in which the pressure medium is separated from the dielectric by an impermeable membrane.

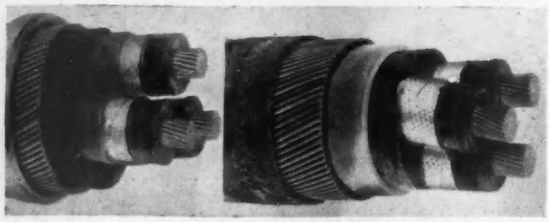


Fig. 5. (a and b) Type H.S.L. (left) and type H. (right) 33 kV 3-phase screened core cables. (¼ full size)

Oil Filled Cables

Modern oil filled cables are almost identical with the original Emanueli design illustrated in Fig. 7. The first installation in Great Britain was a single core 66 kV cable in 1928, of approximately 0·5 miles length, and 37·5 miles of single core 132 kV cable of this type were installed in the London area in 1931. In the same year, a length of approximately 2·5 miles of three core 66 kV cable was also installed. The three core design includes three oil ducts, laid up with the cores, and occupying part of the space normally taken up by fillers. Single and three core oil filled cables are illustrated in Figs. 8 (*a*) and 8 (*b*) respectively.

Cables of this type operate within a range of nominal static pressure of the order of 4·5 to 76 lb/sq in., but transient pressures of up to approximately 115 lb/sq in. can occur during periods of rapidly increasing temperature. Cables are suitably reinforced to withstand these pressures and installations are divided into sections of suitable length to limit hydrostatic pressures, arising from gradients, and to facilitate location of faults. Relays are used to give warning of dangerously low oil pressures.

Gas Pressure Cables

This category includes three main types: (i) gas filled cables, (ii) impregnated pressure cables and (iii) gas cushion cables. All depend for their successful operation on injection into the cable of a suitable gas, usually nitrogen, at a pressure sufficient to suppress ionisation in the dielectric,

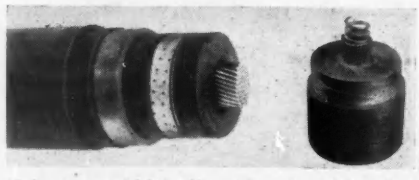


Fig. 6. (left) shows a 66 kV cable with oval conductor. On the right, Fig. 7, is the original Emanueli oil filled 88 kV cable of 1920. (¼ full size)

under working conditions. A pressure of about 200 lb/sq in. is normal but for some 33 kV cables, a lower figure of 100 lb/sq in. has been used. Provision is made for gas flow along the length of the cable and suitable reinforcement is provided. An appropriate gas pressure is maintained, and relays are used to give warning of dangerously low pressures, in service.

Gas filled cables use a dielectric consisting of preimpregnated paper, from which surplus compound has been removed. The interstices between the lapped paper tapes are filled with gas as a component part of the composite dielectric. The pressure retaining lead sheath is applied with a diametral clearance of about 0·025 in. in the

case of single core cables to facilitate axial flow of gas, which also passes along the unimpregnated strand. The filler spaces and strands provide a sufficiently low resistance gas path on multicore cables. About 3 miles of 132 kV single core cable of this type were installed in 1937, and during the next five years additional installations totalled over 18 miles.

Impregnated pressure cables are similar to solid type cables in initial manufacture, except that provision is made for longitudinal gas flow, and compounds suitable for the normally higher dielectric stresses are used for the mass impregnation process. In single core cables, gas flow is facilitated by use of a diametral sheath clearance of about 0·07 in. In three core cables, a lower clearance of approximately 0·03 in. is used with a lead gas channel pipe of about 0·25 in. bore, which is included in part of the space normally occupied by the filler. This pipe is used to provide a low resistance gas path between joints.

The first commercial installation of a 66 kV cable of

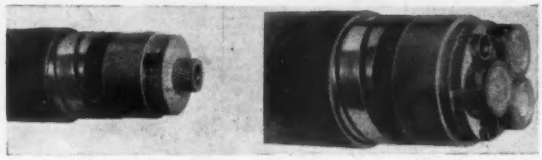


Fig. 8. (a) left, shows a 132 kV single core cable and (b) right, a 66 kV three core cable. (¼ full size)

this type was in 1940. The first three core 132 kV cable in the world was also of this type. In 1944 a length of one mile was installed, together with about 3·25 miles of 132 kV single core cable. The three core cable is illustrated in Fig. 9.

Gas cushion cables were first proposed in 1930 in a form in which a helical spacer separated the dielectric from the sheath, with a sealing compound included to seal off the lower part of the helix, after charging the cable to a suitable gas pressure. The idea was to give a cable with a number of separate gas pockets, each about 1 in. long, and each acting as a separate gas pressure cable section. The object was to reduce loss of gas pressure, arising from jointing operations, or accidental damage to the cable. This feature was abandoned in favour of a continuous gas space throughout the length of the cable.

Compression cables differ somewhat, in fundamental principle of operation, from the types previously described. The inner part of the cable is, for all practical purposes, a solid type cable, with a thin lead diaphragm sheath, enclosed within an outer casing, and the intervening space is filled with gas, under pressure, to supress the formation of voids in the inner cable. For cables up to 66 kV, three cores, in trefoil formation, are sometimes included in a single diaphragm sheath. The outer casing can be a rigid steel pipe line, into which the inner cable is drawn, or it can be in the form of a second lead sheath suitably reinforced, in which case the cable is self-contained. Single core inner cables are made of oval section, so that thermal variations are taken up by changes in the dimension of the minor axis, and to reduce risk of permanent distension, the lead diaphragm sheath is lightly reinforced.

The first gas pressure cable in the world was installed in the London area in 1932 when a length of about 2·5 miles of three core 66 kV compression cable of the pipe line type was put into service. A cable of this type, designed for 132 kV is illustrated in Fig. 10. Pipe line compression cable installations are very resistant to accidental damage, and the relatively large volume of the pipe line may obviate the need for external gas reservoir capacity.

Design Parameters

Agreed values of minimum insulation thicknesses for solid type cables and corresponding approximate values of

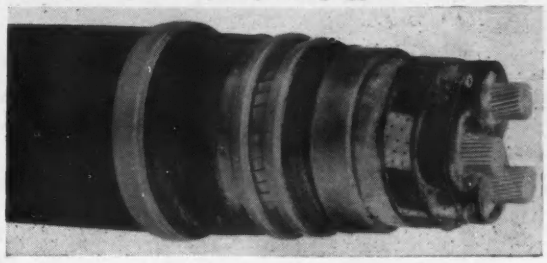


Fig. 9. A 132 kV three core impregnated pressure cable (1944). (¼ full size)

maximum dielectric stress are given in Table II for representative cable sizes. Pressurised cables have dielectric thicknesses, based on maximum stress values, which are determined having regard to test requirements

TABLE II.—SOLID TYPE CABLES FOR 33 kV AND 66 kV MINIMUM INSULATION THICKNESS AND MAXIMUM DIELECTRIC STRESSES.

(*a*) 33 kV Solid Type Cables.

Conductor Section Sq Inches	Single Core		3 Core Screened	
	Minimum Insulation Thickness Inches	Maximum Dielectric Stress kV/cm	Minimum Insulation Thickness Inches	Maximum Dielectric Stress kV/cm
0·1	0·335	38	0·315	39
0·2	0·325	35	0·300	37
0·3	0·300	35	0·280	36
0·4	0·300	33	0·280	35

(*b*) 66 kV Solid Type Single Core Cables.

Conductor Section Sq Inches	Minimum Insulation Thickness Inches	Maximum Dielectric Stress kV/cm
0·2	0·65	44
0·3	0·65	41
0·4	0·65	38

and operational experience. Figures representative of modern design practice for installations in Great Britain, at voltages up to 132 kV are given in Table III.

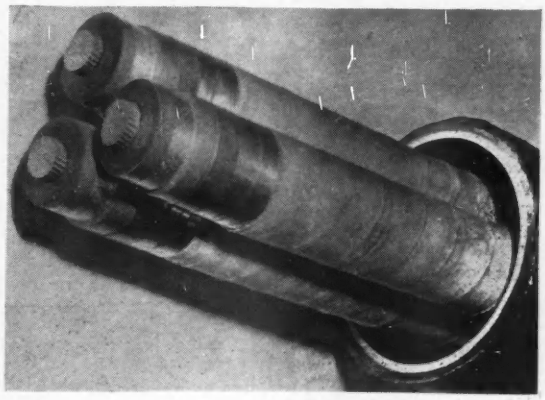


Fig. 10. The pipe line compression cable for 132 kV. (¼ full size)

The maximum operating temperature, allowed for in design of solid type cables, is limited by consideration of the risk of void formation. An additional limiting factor arises from the risk of movement and ultimate sheath fracture, where unarmoured cables are installed in ducts.

TABLE III.—PRESSURISED CABLES. REPRESENTATIVE MAXIMUM DIELECTRIC STRESSES kV/cm.

Type	33 kV	66 kV	132 kV
Oil filled	*	80	90
Gas filled	75	85	90
Impregnated pressure	85	93·5	100
Gas cushion	75	85	85
Compression	—	93·5	110

*A minimum insulation thickness of 0·13 in. is used.

These considerations do not arise in the case of pressurised cables, and higher values are permitted. Values used for both types of cable are given in Table IV.

Current ratings of supertension cables are determined solely by consideration of conductor temperature rise. Typical data, used for determination of ratings, and corresponding rating values for representative conductor sizes, are given in Table V for solid and pressurised cables. For brevity, figures are given only for cables laid direct in the ground, as this is normal installation practice in Great Britain.

To indicate the relative efficiency of utilisation of the conductor material, figures are given of current density in amps per sq in., in addition to current ratings in amperes, and total power transmission in a three-phase circuit. Representative design data are: Ground temperature 15° C, outdoor air temperature 25° C; thermal resistivity of soil 120 thermal ohms/cm cube and thermal resistivity of dielectric 500-600 thermal ohms/cm cube.

TABLE IV.—SOLID AND PRESSURISED CABLES. MAXIMUM PERMITTED CONDUCTOR TEMPERATURES

Operating Voltage kV	Type of Cable	Maximum Conductor Temperature °C		
		In Ground	In Air	In Ducts
	Solid type cables:			
33	Single core	65	65	50
33	3 core armoured and H.S.L. type ...	65	65	65
33	3 core unarmoured ...	65	65	50
66	Single core, circular conductors ...	60	60	50
66	Single core, oval conductors	65	65	50
All Voltages	Pressurised cables, all types	85	85	85

The values given in this Table are the maximum continuous loadings that the cable will carry for an indefinite period without exceeding the stipulated maximum temperature. However, the maximum demand in Great Britain usually occurs for two short periods daily, and a cable, rated for a current capacity equal to the maximum demand, does not attain the permitted conductor temperature, owing to the thermal inertia of the ground. It is possible to calculate ratings on the basis of cyclic load conditions, and allowance for this in calculation of ratings, with resulting economy of conductor material, is now being more often considered.

Materials

The development of satisfactory methods of soldering aluminium has removed previous objections to the use of this metal for cable conductors. Its use commercially will depend on there being a sufficient price advantage, relative to copper, to justify departure from present standard practice.

Use of pure wood pulp sulphate paper is now becoming accepted as standard practice for cables for the highest voltages. The more exacting requirements of these cables have directed makers' attention to the need for use of thinner papers and graded dielectrics. On gas filled cables, for example, it is now standard practice to use four thicknesses of paper from 1·75 to 4·5 mils with suitably graded porosities.

Sheaths

Lead and its alloys are still the materials most commonly used for cable sheaths. During the period under review there have been two important developments in the technique of application, and both were first applied in Great Britain in the years around 1934.

A fundamental change of method was involved in the use of a power-driven screw to feed the plastic metal to the die, thus making continuous extrusion possible. The other development consisted of a major improvement to the normal type of press, whereby the container was filled from the bottom of a tray of molten metal at the top of the press, in such a way that the extruded metal was not exposed to oxidation.

TABLE V.—CABLE RATINGS.

(*a*) *Solid Type Cables*

Conductor Section Sq In.	33 kV, 3 Core			66 kV, Single Core Circular Conductor		
	Amp	Amp/ Sq In.	Circuit MVA	Amp	Amp/ Sq In.	Circuit MVA
0·2	290	1480	17	280	1420	32
0·4	420	1030	24	410	1030	47
0·6	505	840	29	490	840	56

(*b*) *Pressurised Cables*

Conductor Section Sq In.	33 kV to 132 kV		Circuit MVA		
	Amp	Amp/sq in.	33 kV	66 kV	132 kV
0·2	350	1740	20	40	80
0·4	505	1290	29	58	116
0·6	610	1030	35	70	140

The greater uniformity of sheath, obtainable with presses of these types, is most desirable for pressurised cable manufacture, particularly during the initial period when stresses arising from the operating pressure within the cable sheath are being transferred to the reinforcement. Typical figures of sheath thicknesses for these cables are given in Table VI.

Aluminium cable sheaths were first used commercially in Great Britain in 1948 and initial experience was gained on cables for voltages up to 11 kV.

In 1951 the first aluminium sheathed 33 kV three-core impregnated pressure cables in the world were used in

TABLE VI.—REPRESENTATIVE LEAD SHEATH THICKNESS FOR PRESSURISED CABLES OF VARIOUS DIAMETERS

Diameter under Sheath In.	Approximate Lead Sheath Thickness In.
1·0	0·086
2·0	0·097
3·0	0·117
4·0	0·138

London and Birmingham, when lengths totalling about 11 miles were installed. The greater strength of

TABLE VII.—REPRESENTATIVE ALUMINIUM SHEATH THICKNESSES FOR CABLES OF VARIOUS DIAMETERS

Diameter under Sheath In.	Approximate Aluminium Sheath Thickness In.	
	Swaged Type	Welded or Corrugated Type
1·0	0·068	0·051
2·0	·12	0·087
3·0	·15	0·126

aluminium sheaths obviates the need for reinforcement on pressurised cables. The main methods of aluminium sheathing are: (*a*) Drawing the cable into an oversize aluminium tube which is subsequently swaged down to fit the cable. (*b*) Forming a sheath around the cable from aluminium strip which is seam-welded longitudinally. The sheath is then rolled down to fit the cable, or corrugated in some cases to give better flexibility, and (*c*) direct extrusion which has recently been demonstrated in this country. (An article giving details of the plant used for this purpose appeared in our issue of 10th June.)

It has been found that the main criterion, in deciding the thickness of the sheath, is the bending performance, and typical figures, graded with the overall diameter of the cable, are given in Table VII. A minimum purity of aluminium of 99·5% is specified.

Reinforcement and Armouring

Reinforcement is not normally used on solid type cables. Armouring consists of steel wires or tapes as required, and there have been no noteworthy changes in recent years.

Pressurised cables fall into categories according to type and operating pressure, and for gas pressure cables, there is further subdivision according to the preferences of individual manufacturers. Non-magnetic tapes must be used for single core cables, and these are usually of suitable non-ferrous alloy, but for three core cables steel tapes may

TABLE VIII.—GAS CUSHION CABLES. REPRESENTATIVE REINFORCEMENT THICKNESS FOR 3-CORE CABLES USING STEEL TAPES

Internal Diameter of Sheath In.	Approximate Total Radial Thickness of Reinforcement In.
1·5	0·016
2·5	0·028
3·0	0·032
4·0	0·044

be used. The reinforcement also normally provides the required degree of armouring.

Oil filled cables, operating at relatively low pressure, require light reinforcement. This usually consists of a single strip of hard brass or copper alloy tape of thickness 0·006 to 0·008 in. and of suitable width, applied helically with a short lay, over a bedding of compounded cotton tape on the lead sheath. Gas pressure cables, operating at pressures up to 200 lb/sq in., require heavier reinforcement. Gas filled and gas cushion cables use metal tapes, applied at an angle of approximately 60°, which provides both circumferential and longitudinal reinforcement. Impregnated pressure cables use separate longitudinal reinforcing tapes, 0·25 in. wide, applied at an angle of 20° to the cable axis. Over these, two metal tapes with 50% overlap and a short lay, provide circumferential reinforcement. Their thickness varies with the cable size and material used, from 0·004 to 0·025 in. approximately.

Substantially the same total thicknesses of reinforcement are used on the various types of gas pressure cables. Table VIII gives typical radial thicknesses of steel reinforcement, used on three core gas cushion cables, as being representative of all those used on all types.

Compression cables have the diaphragm sheath lightly reinforced circumferentially by two metal tapes 0·003 in. thick. The outer sheath of the self-contained compression cable is reinforced by two tapes applied with a short lay. Longitudinal reinforcement is only used where the cable is not directly buried, and consists of narrow tapes applied with a long lay, over the circumferential reinforcement.

Protection of the reinforcement of pressurised cables is imperative, to ensure continuity of service. The high price of lead now normally precludes the use of an additional lead sheath for this purpose. The introduction of sheaths of aluminium, which is much more susceptible to corrosion than lead, also emphasises the need for highly efficient protective servings.

The serving must provide a barrier impermeable to moisture and other corrosive agents, and must have sufficient mechanical strength to obviate damage during installation. Rubber, used in conjunction with bitumen, has been used extensively for the impermeable barrier since 1933. More recently polyvinyl chloride tape has been used also. Outer wrappings of hessian or similar material are used to provide some degree of mechanical protection to the impermeable layer. (*To be concluded*)

DEARTH OF TECHNOLOGISTS

ISSUED this week by the Parliamentary and Scientific Committee is the report of the Sub-Committee on Higher Technological Education. This again sounds the warning that the future of this country may be jeopardised by the unfavourable output of qualified engineers and other technologists. Even now, says the report, there is a considerable unsatisfied demand for qualified men in British industry and this is liable to increase as management realises the importance of scientific knowledge. Despite the work that successive governments have done to improve situation, still further government action is urgently needed. As far as universities are concerned, it is recommended that the arbitrary dictum of the Barlow Committee that the number of art students at universities should be doubled as well as that of science students should be abandoned.

Colleges of Technology, it is suggested, should be, in certain cases, granted a Royal Charter and these should have the maximum academic freedom and complete financial independence in the same way as the universities. They should not be too specialist in nature, should infuse the humanities into the courses, and be encouraged to build up their own scientific and technological education schemes thus earning a reputation for themselves in particular sciences and technologies. The award suggested for qualification in such colleges is Bachelor of Technology.

Commenting on the intake to such colleges, the Report criticises the present situation at the grammar schools and public schools, which is remarkably unsatisfactory, partly due to the shortage of science teachers of good quality, and partly due to the attitude towards careers in science and industry.

Of the 8,000 State Scholars in the country, only about 600 are specialising in scientific subjects, and in many new secondary schools accommodation for practical work is almost non-existent. To remedy this situation will need intensive and long-term efforts by industry and the professional institutions.

Symposium on Peat

Problems of Exploitation of Peat Deposits

IN many countries in the temperate zones of the northern hemisphere, the increasing demand for fuel coupled with the rising cost of coal and oil have led to an investigation of the potentialities of peat. These investigations have been spurred both by the development of boilers for turf firing and by the possibility of using powdered peat as a fuel for direct burning in gas turbines. So great has the interest in this subject become that an International Peat Symposium, under the auspices of Bord na Mona was recently held in Dublin.

Furnace Development

Section "A" of the Symposium dealt mainly with the availability of peat in various countries. In section D.1, however, the problems of utilisation were discussed. Messrs Otto Engler and Reinhold Mutke gave a description of the developments which had led up to the production of furnaces equipped for firing milled peat as pulverised fuel. They also gave details of the mills used for grinding the peat. It was found that satisfactory combustion was obtained for peat of less than 10% moisture content, with 50% of it passing a 170 B.S.S. sieve. It was also found, however, that if the temperature of the classifier outlet of the mill exceeded 90° C there was a danger of explosion.

Pulverised firing boilers have only been used on a large scale by Russia, and no reliable information was available concerning these. Experimental work had thus to be started *ab initio*. It was found that a particularly long flame was desirable as peat had a high volatile content, further, the long flame allowed the coarser particles sufficient time for burning out. A boiler using this principle had been designed for Rhinish raw brown coal and had a capacity of 795 klb/hr at 1,940 lb/sq in., 986° F.

The danger of mill explosions due to excessive predrying of the fuel, or too high classifier temperatures could be eliminated by a flue gas recirculation system to provide a CO_2 content of 6-7% in the mills.

Another paper from Germany was that by Dr O. von Swietochwski who dealt with the general question of the importance of peat for steam generation. The relative importance of peat as a fuel naturally varied according to the availability of other fuels in the several countries concerned. In Ireland, with negligible coal deposits, no oil and no natural gas, the utilisation of the vast stocks of peat is of great importance. He dealt with the two methods of using peat: sod peat, burned on a travelling grate, and milled peat, burned in a cyclone type boiler furnace or fired through a jet type burner. Messrs Walther and Cie, Germany, had designed a four-corner mill furnace and boiler to produce 220 klb/hr of steam for the Ferbane station.

Mr G. Redottee, Babcock and Wilcox, Oberhausen, also described a boiler for Ferbane. (Note: There are to be three 220 klb/hr boilers in this station and each is being built by a different German firm.) The main section of this paper dealt with peat handling and milling problems.

Present Installations

The two existing stations of Allenwood and Portarlington were described by Mr P. Cooney of the Electricity Supply Board. Allenwood, commissioned in January 1952, has a maximum capacity of 40 MW and is equipped with four 125 klb/hr Babcock and Wilcox water tube boilers, while Portarlington, commissioned some three years ago, has three similar boilers. All these burn sod peat on travelling grate stokers. A problem here is the "mull" which consists of finely divided peat and peat dust. This, in general, contains more moisture than the sods themselves, and, on the grate, blanks off the undergrate air leading to irregular combustion with loss of efficiency. The only solution to the problem yet found is manual poking to break up the heaps of mull and sods.

On the general combustion of milled peat was a paper by Mr Ralph A. Sherman, Technical Director of the Batelle Memorial Institute, Columbus, Ohio. This paper was based on an investigation which was carried out for the Bord na Mona by the United States Economic Co-operation Administration and gave a general review of the factors involved in the preparation and burning of milled peat both on stokers and by burners. Some comments on the use of milled peat for gas turbine work were also included.

Gas Turbines

The use of peat in gas turbines was the subject of Mr J. D. Thorn's paper. This dealt largely with the experiments which have been taking place at Lincoln on the Ruston and Hornsby plant. The great advantage of the gas turbine is that all its waste heat appears in the exhaust at a relatively high temperature and this can be used to overcome the difficult problem of drying. A suggestion is made that peat could be dried under pressure and the steam so formed used as a working fluid. Although no practical work has been done on this scheme, calculations indicate that remarkable increases of power output become possible. Using the same size compressor and the same total air flow, retaining the steam in cycle has the effect of increasing the power output by a factor of 5.

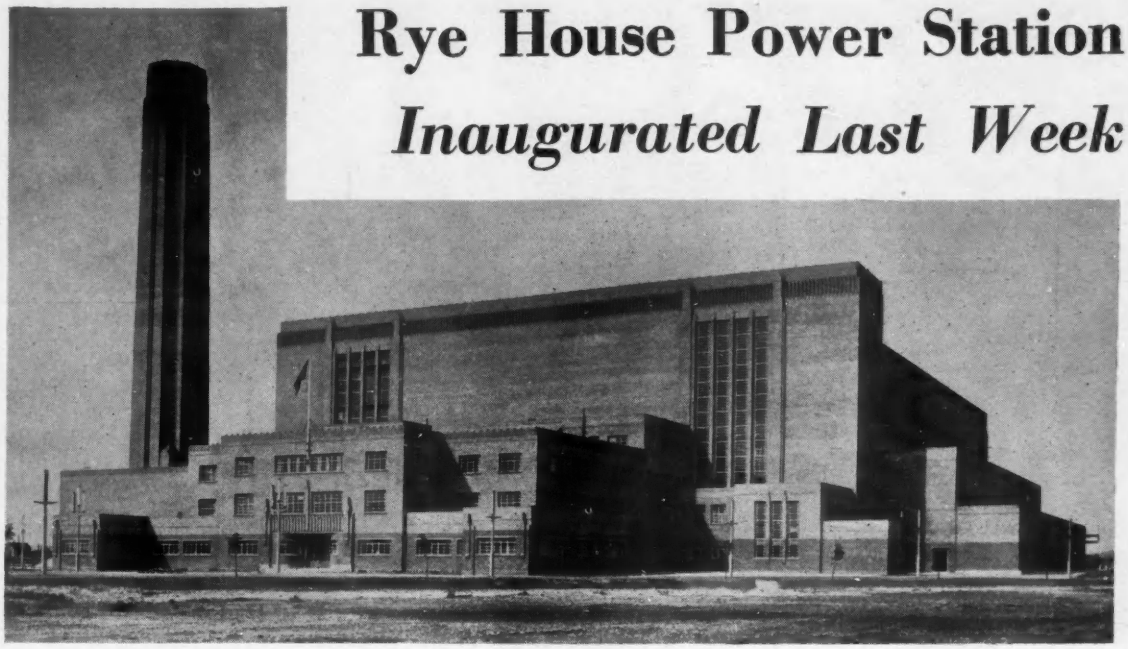
Problems of combustion and control were dealt with by Mr M. J. Kemper, also of Ruston and Hornsby. To obtain good combustion a high proportion of tertiary air was required, and for control purposes, the pulverised peat had to be put into a state of "fluidisation" by means of compressed air. In this state, control could be exercised by the use of a manually operated valve.

The closed cycle, peat-fired gas turbine was considered by Mr J. B. Bucher of John Brown. He outlined some of the experimental work which had been carried out in the course of development of the 2,000 kW unit being built for the North of Scotland Hydro-Electric Board, and suggested that on a plant of this size the efficiency should be of the order of 25% based on the output at the alternator terminals. For plans of 15-20 MW an efficiency of 30% should be readily obtainable.

The main troubles which had been found with the experimental plant were associated with the peat handling and feeding equipment, and nearly all the units of the combustion circuit and the peat handling arrangements required considerable modification before satisfactory results were obtained.

Rye House Power Station

Inaugurated Last Week



LOCATED some twenty miles from London, in Hertfordshire, near Hoddesdon, is Rye House generating station. This project was conceived in the pre-war years by the Northmet Power Company, but construction was deferred and it was not until 1947 that a start could be made on the actual job of building. The station layout was planned for an ultimate capacity of 192 MW in six 32 MW turbo-alternator sets. At the moment, four of these, together with their associated boilers, have been completed and are commissioned. It was, however, thought that at this stage the time was opportune for a formal opening of the station, and this was performed last Thursday by the Hon. David Bowes-Lyon, Lord-Lieutenant of Hertfordshire.

Station Arrangement

The site has an area of about 100 acres, with a frontage of 3,400 ft to the River Lea Navigation, and adjoins the main Cambridge line of British Railways Eastern Region. The boiler house has been designed for an eventual length of 420 ft by 100 ft wide by 100 ft high, while the turbine house and mechanical annex have a combined width of 150 ft.

As can be seen from the photograph (p. 152), the turbo-alternator sets are arranged transversely in the turbine room, with the coal bunkers and mechanical annex interposed between the boiler house and the turbine room. External precipitators have been erected, and the induced draught fans, also external, are afforded some protection by being located at ground level between the precipitators and the main gas flue leading to the chimney. Exit gases from the four boilers now installed pass via the precipitators into a single chimney located at the south-west corner of the main station building. Operation is on the unit principle, there being one boiler to each machine.

Boiler Plant

Each boiler, made by Babcock and Wilcox Ltd., is of the Series High-Head type, and has a maximum continuous evaporation rate of 350 klb/hr, with outlet steam conditions of 875° F, 650 lb/sq in. They are pulverised fuel fired, and four Babcock and Wilcox No. 44 "E" type mills are provided for each unit. A classifier is situated in the top section of each mill, and returns coarse particles of coal back to the grinding section for further pulverisation. Two Howden-Ljungstom regenerative air heaters are provided for each boiler, and other auxiliaries include two forced draught fans, fitted with vane control equipment, and two induced draught fans. All the fans are driven by 2-speed motors and have vane control equipment.

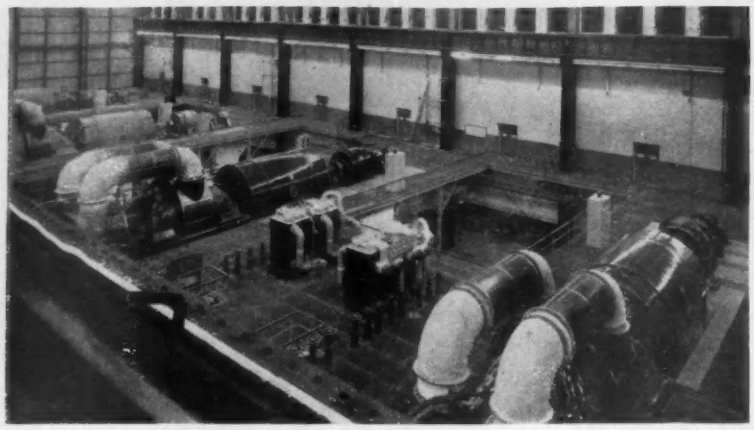
The feed pumps by G. and J. Weir and Co. are of the ten-stage horizontal centrifugal design, each capable of a normal load output of 193 klb/hr against a discharge pressure of 940 lb/sq in. There are three pumps, all electrically driven per set, and for the first two boiler units a steam-driven stand-by pump is also provided.

Turbo-Alternators

The turbines, constructed by Richardsons, Westgarth and Co., Ltd., are three cylinder, simple tandem, impulse reaction machines designed for stop valve steam conditions of 850° F at 600 lb/sq in. One row of impulse blades is included in the h.p. section. Design steam consumption at full load is 9·04 lb/kWh, with a heat consumption rate of 10,060 B.T.U./kWh.

Designed and built by C. A. Parsons and Co., the alternators have a rating of 30 MW at 3,000 r.p.m. and are wound for 33 kV 3-phase. An auxiliary alternator is direct-driven from the main machine and is rated at 2 MW. This is wound for 3·3 kV. Both main and auxiliary alternators are cooled by air on the closed circuit principle. Excitation is by means of direct coupled main and pilot exciters and automatic voltage regulators of the normally inactive type are included in the excitation circuits of main and auxiliary alternators.

To protect the turbo-alternators in the event of loss of vacuum, a relay operated device has been incorporated in the turbine control which automatically reduces the



The machine arrangement is shown in this view of the turbine room. An unusual feature of these machines is the use of standard diesel injection pumps for high pressure oil supplies to the bearings for jacking purposes

load progressively should the condenser be unable to maintain a satisfactory low back pressure.

Four stage feed-heating is used consisting of one combined l.p. heater and drain cooler and one low level deaerator followed by two stages of h.p. heaters.

Circulating water for the condensers is provided partially by the River Lea, which can supply sufficient water for one set, and partially by three reinforced concrete natural draught cooling towers. Each tower is supplied by two pumps which draw water from a common condenser discharge culvert. The discharge from the towers passes into a common inlet culvert into which river water also flows. Thus all three towers are in parallel with the river supply and can be used singly or in any combination to suit whichever machines are running.

Transformers and Switchgear

Although the station is designed on the unit principle, there are no direct connected generator transformers, the output from the alternators being switched on to the 33 kV busbars of the main switchgear. This switchgear made by British Thomson-Houston, is of the outdoor type and has a rupturing capacity of 1,000 MVA. It is arranged in two groups of double busbar form having two oil circuit-breakers per circuit. The Grid supply is obtained by stepping up the voltage from 33 kV to 132 kV through four 45 MVA transformers which also function as reactor couplings between the two groups of switchgear.

In addition to the direct coupled house service alternators, supplies for works power auxiliaries are also derived from the 33 kV busbars through one 3 MVA transformer per alternator. Each transformer feeds a 3·3 kV double busbar works switchboard, and the essential auxiliary plant is divided equally between these supplies. The 3·3 kV supply is again stepped down as required for low voltage auxiliaries.

The control room is located in the Administration Block with easy access to the station. Semi-miniature control panels are used, each panel carrying its own alarm annunciator. Synchronising is carried out at the panels using trolley-mounted equipment, but running control is from a centrally-mounted desk. This desk carries the turbine and boiler house telegraph transmitters and has logging facilities for the two control engineers. Main metering equipment and printometers are housed in a room adjacent to the control room.

Coal and Ash Plant

Fuel is brought in by rail from the East Midlands coal fields and discharged from the trucks by side discharge tipplers. An underground conveyor system feeds the coal either to station bunkers or the coal store. Storage and reclamation is by means of a "Beaumont" type drag scraper provided by International Combustion Ltd. This has a capacity of 200 tons/hr with an average haul of 220 ft.

Ash hoppers are of the hydrojet type designed for side discharge into a sluiceway which can deal with ash at the rate of 40 tons/hr. The high pressure sluicing pumps are

The control room is shown here. Note the synchronising gear mounted on the trolley. The desk also contains telegraphic and telephonic facilities in addition to control instruments for the normal running of the station

single stage centrifugal units each capable of passing 1,700 gallons of water per minute against a discharge head of 275 ft. The ash is discharged from the sluiceway via a crusher unit into a concrete sump, and is then pumped to an elevated ash drainage bunker, whence the drained ash is removed by road or rail for disposal. Dust is removed from the precipitator hoppers by hydraulic ejectors which discharges it to the ash sump from which it is pumped off by a slurry pump. Disposal is then to worked out ballast pits in the vicinity.

The Opening

At the opening ceremony, Sir Henry Self, in jocular vein introduced the Hon. David Bowes-Lyon and invited him to unveil a commemorative plaque. In his remarks, the Hon. David Bowes-Lyon referred to the excellent work of Sir Giles Gilbert Scott in the architectural design of the station. It was, he said, the largest station in Hertfordshire and should play a vital part in the county's life.

Mr W. N. C. Clinch, Divisional Controller, who presented the Lord-Lieutenant with a replica of the plaque, mentioned the early work which had been done in the days of the Electricity Commissioners. He also had some remarks to make on the negotiations which had to be conducted with local water authorities to obtain an adequate supply of cooling water.

Principal Contractors

Superstructure and Ancillary Buildings	Walter Lawrence and Son Ltd.
Steelwork	Dawnays Ltd.
Cooling Towers	The Davenport Engineering Co., Ltd.
Precipitator Housings and 132 kV Switchgear Structure	Bierrum and Partners Ltd.
Circulating Water Culverts	J. L. Kier and Co., Ltd.
Circulating Water System	William Press and Son Ltd.
Railway Access and Sidings	Thos. Summerson and Sons Ltd.
Boilers	Babcock and Wilcox Ltd.
Turbines	Richardsons Westgarth and Co., Ltd.
Alternators	C. A. Parsons and Co., Ltd.
Condensers and Feed Heating Systems	Richardsons Westgarth and Co., Ltd.
Evaporators	Aiton and Co., Ltd.
Circulating Water Screens	F. W. Bracket and Co., Ltd.
Circulating Water Pumps	Mather and Platt Ltd.
Boiler Feed Pumps	G. and J. Weir Ltd.
Precipitators	Lodge-Cottrell Ltd.
Coal Handling Plant	International Combustion Ltd.
Ash and Dust Plant	B.V.C. Industrial Constructions Ltd.
High Pressure Pipework	Stewarts and Lloyds Ltd.
High Pressure Valves	Hopkinsons Ltd.
Low Pressure Valves	J. Blakeborough and Sons Ltd.
Vacuum Cleaning Plant	Sturtevant Engineering Co., Ltd.
Automatic Fire Protection	Mather and Platt Ltd.
Turbine House Crane	The Clyde Crane and Engineering Co.,
Main Switchgear	British Thomson-Houston Co., Ltd.
Works Power Switchgear	British Thomson-Houston Co., Ltd.
Main and Auxiliary Transformers	Fuller Electrical and Manufacturing Co., Ltd.
Main and Secondary Cables	British Insulated Callenders Cables
Auxiliary and Lighting Wiring	Eastern Electricity Board.
Fluorescent Fittings and Lamps	Thorn Electrical Industries Ltd.
Motors	Lancashire Dynamo and Crypto Ltd.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Status of the Handyman

I HAVE read the note by "Peregrin" in his column in the current issue of the ELECTRICAL TIMES referring to "Dabblers."

His theme, as I understand it, is perish the "Dabbler" and live the professional. Having had experience of the latter, I am not so sure. One generally finds that having incurred their bills, one has to go round and either remedy what they have done, or do the things that they ought to have, but have not done. This appears to apply also to plumbers.

If the house in which we live at present is any criterion, I am not impressed by "Peregrin's" argument that the professional is always right. Examples are: Five blacks (in T.R.S.) joined by a connector under a floorboard without a proper junction box, two 15-amp plug points on one circuit wired with 7/·029 (non-ring circuit), and all the upstairs rooms and one downstairs (7 in all) on one circuit. This is in course of being put right by me without, of course, taking too much of the house to pieces in the process. We had no less than 5 main switches and a veritable bird's nest for mains gear. However, a Consumer's unit and four teak dis-boards have remedied this.

My own experience of professionals (and this seems to apply to most trades) is that unless you are prepared to "sit on their tails" all the time that they are at work for you, they will not or cannot do a job properly. In the circumstances, therefore, I prefer to save myself trouble, and also their wages, and do the job myself if I possibly can. At the same time I have the advantage of knowing what has gone into the job.

It is of interest to note that "L.B.S.C." of *The Model Engineer*, who writes articles in that publication on the design of model steam locomotives, says in a recent article that he could carry out an electrical installation which would pass all the tests and, in fact, seems to imply that there is really nothing in it at all.

A further comment on "Peregrin's" contention, is an article in your editorial, in the very same issue, in which an electrical contractor (and presumably a professional) installed what must obviously have been an inefficient earth connection to a boiler which resulted in the death of an unfortunate woman.

To conclude this somewhat verbose epistle, I would say that "Peregrin" cannot have much experience of things as they are, and as a sort of Parthian shot, would sign myself

Unrepentant Dabbler,

(Or as our French friends would have it: *Vive les Dabbleurs.*)

STAFFORD.

"Cutting Chases"

I AM sorry that I cannot share "Megohm's" tears concerning the wickedness of manufacturers for making patent partitions, or of architects for using them, for surely if the installation engineer will persist in using rigid metal conduits in entirely unsuitable conditions, instead of light flexible alternatives, then that is his grief. I have recently been shown over a new block of flats in which patent partitions were used, and the despairing architect showed me how practically every wall was embellished with long rust streaks, finished off with rectangular rust marks at switch and socket terminations; this installer, too, "preferred the steel conduit system," but surely architects are entitled to expect something better in these enlightened days.

If "Megohm" will study some of the newer systems he will find that it is possible to obtain small flexible conduits that may be run in wall angles and brought horizontally to switches, or even placed in the space between door frame and partition, and that will effectively solve the problems he describes. Further, the architect will not be faced with the problem of effacing rust marks, which seem to occur more readily with patent partitions than with others, however close to the surface these small conduits may be.

T. C. Gilbert,

FOLKESTONE, KENT.

notes on wiring

by Megohm

I NOTE that the question of Registration is still being discussed in the many fields of the electrical industry. The sponsors of this motion to have all electrical contractors and operatives registered by statute had, obviously, the grave threat of inferior installations resulting from the efforts of unskilled operatives well in mind when they raised the matter. I have already made several remarks in these Notes on the possibilities of shock and even death resulting from the efforts of the amateur wireman. I have also expressed my opinion of the alleged electrical accessories which can be purchased by all and sundry at the many multiple stores who advertise an "electrical department." Even used by skilled men these shoddy articles are a source of danger. The absence of regular tests of installations *by law* means that much of this bad work is never heard of or seen and is often, for instance by house purchase, inherited by some unfortunate person who receives a "shock" in more ways than the one we naturally think of.

Almost every day we can find a little piece in the Press which spotlights some idiot's idea of an electrical gadget, for instance, the person who found a new use for his Christmas decoration lamps. This was to wrap the set of lamps around the cistern and pipes in the outside lavatory to keep the pipes from freezing. How nice to own a private electric chair.

Then there was the person who made himself a "demister" for his shaving mirror out of a surplus windscreen demister by connecting this to a "6 or 12 V transformer which can be bought at any junk store for a few shillings." The primary of the transformer, it was stated, should be connected to the nearest mains switch socket and the output side to the demister. I suppose the obvious place to site the transformer was on the edge of the bath or somewhere like that. How we in the electrical trade are expected to counteract this dangerous practice of printing such ideas in the Press evades me. Unless the matter is tackled soon it may prove very serious indeed to the industry and the public in general.

Installations in Bathrooms

It is in the bathroom of a house that the skilled man finds much to criticise in the electrical installation. In spite of constant warnings, the average householder appears to consider that no danger exists by *carefully* standing an electric fire on the floor of the bathroom and connecting to the socket in the hall. In fact, I know of bathrooms which have *recessed* fires installed at low level.

Every engineer is familiar with the dangers of electrical apparatus in bathrooms. The I.E.E. lay down their recommendations for the precautions to be taken in installations in bathrooms and I consider these are always worthy of being described again. Bathrooms require special precautions to ensure safety, because any person taking a bath would, to say the least, be in a very effective contact with "earth." If the person came into contact with live metal the result would be disastrous. In such a room, metal conduits and other metal parts of the installation should be completely concealed in walls and floors. Alternatively they should be screened so that they cannot be touched. Of course, this is not always possible and under such conditions an earthing strip should be connected to all metal conduits, water pipes and other metal in the bathroom and the strip effectively bonded to "earth." This will ensure that all metal in the bathroom (except conductors) remains at the same potential. Careful tests should be carried out to ensure that the connections to the conduits, etc., are electrically continuous and, if necessary, they should be bonded. This arrangement should be regularly tested and inspected, special attention being paid to all connections and to the earth strip itself to ensure that no serious deterioration is taking place.

If there be any intention to utilise a water pipe of either the cold water service or the water-heating apparatus as a uniform potential conductor, it must be ascertained that the pipework is electrically continuous. Regulation 1002 deals fully with these requirements but one matter which I would like to see improved is the ceiling switch which is so much used in the bathrooms. I appreciate that little danger exists in the changing of a lamp, but there are people who fight shy of this job in a bathroom and give the reason that they can never tell if the switch is in the "off" position. If one considers this point for a little while it does not appear to be such a stupid reason. Quite a number of bathrooms are fitted with lights over the wash basin and to the ordinary person there exists the idea that a shock might be received if both the basin and the lamp were touched at the same time. I wonder if there exists, or could be made, a ceiling pull switch with mechanical indication whether the switch is "on" or "off."

Miniature C.B.s

Not many pages away from the article, in a monthly journal for supervisors, which prompted me to start off these Notes in the manner I have, is an interesting little article on development in the electrical industry. It deals with statistics compiled by Fire Authorities and goes on to discuss the use of h.r.c. fuses in houses and then the question is asked if a m.c.b. of the plug-in type could not be marketed at a cost even lower than that of the h.r.c. fuse. These thoughts and questions are, in my opinion, worthy of the most serious consideration. I understand that there is already, somewhere in the industry, a miniature c.b. intended for incorporation in radio and television sets and rated at 1 amp, which has been proved to be very effective and cheap to manufacture. Surely this is the answer to quite a number of situations and a suitable m.c.b. could be produced which could be used to protect installations in bathrooms. I feel sure that the people who specialise in c.b.s could evolve something on these lines for protecting circuits serving fires in bathrooms and also the lighting points in bathrooms. It would not increase installation costs so very much to treat the lighting and apparatus circuits separately and control them at the fuseboard position by m.c.bs. These protective devices should, of course, be covered by some Regulation, and provision of a B.S.S. would be of great assistance.

SIMPLE CONTROL SYSTEMS

Part 4. Methods employing continuous control are now discussed in the fourth of this series

By P. D. ATKINSON, M.A., A.M.I.E.E.

THE last two articles in this series describing closed loop systems were concerned with arrangements in which the method of control was discontinuous, the operation of the system depending on a switch of some kind. Although such systems have considerable application, for certain purposes it is more advantageous to employ methods in which control is effected continuously and this type of control will now be considered.

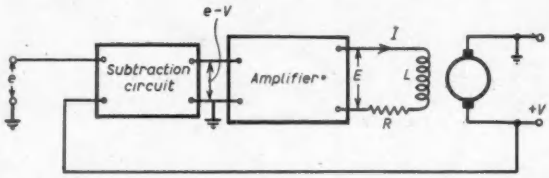


Fig. 1. This diagram shows, in schematic form, a closed loop control system of the first order type for regulating the output voltage of a d.c. generator

In continuous control systems all the elements in the loop accept and give out signals which are continuously variable. This feature distinguishes them from discontinuous ones which include switching devices. In general, continuous systems are more elaborate and costly than discontinuous ones; however, they can normally be designed to operate more quickly and more accurately and they are not caused to oscillate by a steady external disturbance (as an externally applied torque in the case of a position control servomechanism).

Continuous systems are conveniently classified on a basis of their dynamic characteristics, the performance of all systems of a particular class being represented by equations of the same form. Thus, although they may perform widely different functions, they have many properties in common.

To find out to which class a particular system belongs it is simply necessary to determine how many separate energy storage devices it comprises; the number of energy storage devices then determines the "order" of the system. Thus a system with only one energy storage device is a First Order System, one with two energy storage devices is a Second Order System and so on. Common examples of energy storage elements are capacitors, inductors, moving parts having appreciable inertia and devices having thermal capacity, as a tank of liquid of varying temperature. In this article the properties of first and second order systems are considered.

First Order System

An example of a first order system is shown in Fig. 1 and it will be used as a basis for the discussion of the properties of this type of system. It is, however, important for the reader to appreciate that the equation of motion of any other first order system will be of the same form as that derived below. It is thus permissible to regard the dynamic properties which result from this equation of motion as being general properties of first order systems.

The arrangement shown in Fig. 1 is a closed loop control of the output voltage of a d.c. generator. The output quantity is the terminal voltage of the generator and the input quantity is a voltage equal to that required from the generator. The input and output voltages are compared in an electronic amplifier and the difference is amplified to control the generator field current. The static properties of a similar system were considered in the first article in this series, let us now consider the effect of the inductance of the field winding on the dynamic properties. If, as is reasonable in such a case, we assume that the response of the electronic amplifier is instantaneous, it follows that it can have no significant energy storage devices. The generator itself is a rotating machine and thus stores kinetic energy. However, we shall assume that the speed of rotation does not change during normal operation and we are thus justified in omitting it from the count. The inductance of the generator field winding is then the only energy storage element to be considered and therefore the system is of the first order.

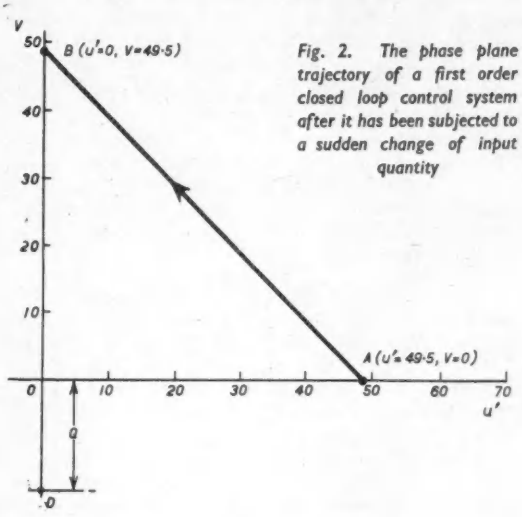


Fig. 2. The phase plane trajectory of a first order closed loop control system after it has been subjected to a sudden change of input quantity

For simplicity we shall neglect the output resistance of the generator and its operation can therefore be represented by the equation

$$V = K I \qquad \text{(1)}$$

where K is a constant.

The amplifier gain is g volts output for one volt difference between the two inputs, thus

$$E = g(e - V) \qquad \text{(2)}$$

where E is the open circuit output of the voltage amplifier. If the total resistance in the amplifier output circuit, including that of the field winding is R, and L is the inductance of the field winding

$$E = R I + L I' \qquad \text{(3)}$$

where I' = the rate of change of I.

From equation (1) we have

$$V' = K I' \qquad \text{(4)}$$

then eliminating I and I' from equation (1), (3) and (4) we have

$$E = \frac{R}{K} V + \frac{L}{K} V' \qquad \text{(5)}$$

And from equations (2) and (5)

$$\frac{L}{R} V' + \left[1 + \frac{kg}{R}\right] V = \frac{Kg}{R} e \qquad \text{(6)}$$

This is the equation of motion of the system; it can be solved graphically by the method introduced in the second article in this series. The standard form of the equation for solution by this method is

$$V'' = -p^2 V - p^2 Q \qquad \text{(7)}$$

In order to put equation (6) into the required form we must equate the rate of change of each side, thus

$$V'' + \frac{R}{L}\left[1 + \frac{Kg}{R}\right] V' = \frac{Kg}{L} e'$$

and therefore

$$Q = \frac{V'}{p^2}\,\frac{R}{L}\left[1 + \frac{Kg}{R}\right] - V - \frac{Kg}{Lp^2} e'$$

Now p is a scale factor defined by the equation $u' = V'/p$ where the phase plane co-ordinates are V and u'. In this case let

$$p = \frac{R}{L}\left[1 + \frac{Kg}{R}\right]$$

Then if we consider the motion when the input quantity is not varying, $e' = o$, we have

$$Q = u' - V \qquad \text{(8)}$$

Example.—Consider as an example for solution a system in which $Kg/R = 100$ and $L/R = 2$ seconds. Suppose that initially $e = V = O$ and consider the changes following a sudden rise of e to 50 volts. From the values given $p = 50{\cdot}5$. The initial value of

$$u' = \frac{1}{p}\,\frac{Kg}{R}\,\frac{R}{L} e \quad \text{(from equation 6)}$$

$$= \frac{1}{50{\cdot}5} \times 100 \times \frac{1}{2} \times 50 = 49{\cdot}5$$

This gives the starting point of the trajectory at A in Fig. 2. The trajectory can now be plotted by the graphical method using the above equation for Q. It is found to be a straight line at an angle of 45° to the axes and cutting the axis of V at B where V is approximately 49·5. Now from equation (8), when $u' = 0$, $Q = -V$. Therefore the centre about which the next small section of the trajectory must be drawn lies in the trajectory and there can therefore be no further motion. The system must therefore remain at rest at this value of V.

Since the time interval associated with each of the small

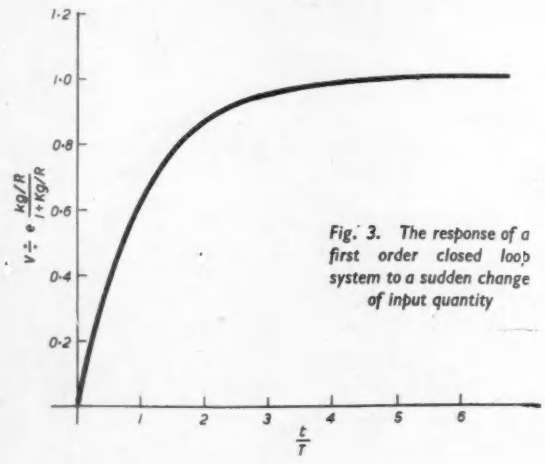


Fig. 3. The response of a first order closed loop system to a sudden change of input quantity

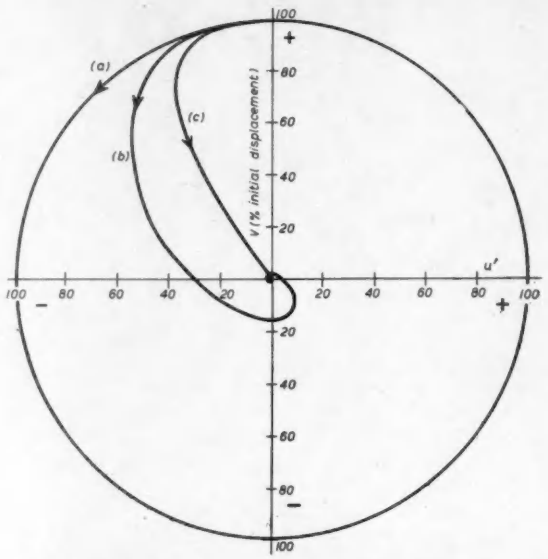


Fig. 4. Transient response trajectories of a second order closed loop system (after a sudden change of input) in which the damping factor a has values of (a) 0, (b) 0·5 and (c) 1

circular arcs can be calculated it is possible to plot a graph of V against time; this curve is shown in Fig. 3. It can be shown mathematically and the reader can verify by means of further examples that the trajectory of a first order system is always a straight line of this slope when plotted on axes of V and V'/p. There is no overshoot and the system will not oscillate under any circumstances. It can also be shown that the curve in Fig. 3 is described by the equation.

$$V = e\,\frac{Kg/R}{1 + Kg/R}\left[1 - \epsilon^{-\frac{t}{T}}\right] \qquad \text{(9)}$$

where t = time (seconds)

ϵ = the base of natural logarithms

and $$T = \frac{L}{R\left[1 + \frac{Kg}{R}\right]}$$

Second Order System

One of the most important examples of a second order system is the position control servomechanism in which the position of some mechanical member having inertia is controlled in response to a signal which may take one of many forms—electrical, pneumatic, hydraulic, or mechanical. Discontinuous position control systems were considered in some detail in the second and third articles of this series. In these articles the main example considered consisted of a voltage regulator in which an electric motor drove the brush arm of a continuously variable auto-transformer in such a way as to reduce errors in the output voltage. Let us now consider a similar device in which the voltage sensitive relays have been replaced by an electronic amplifier which controls the motor field and thus, if the armature current is made to be sensibly constant, the motor torque.

The voltage applied to the input terminal of the electronic amplifier is made proportional to e, the error in the output voltage. Therefore

$$i = K e \qquad \text{(10)}$$

where K is a constant and i is the field current.

The field current is controlled by electronic valves which can be made to have a very high impedance. Thus the time required for i to change in response to a change of e can often be made small. In this case, in order to simplify the

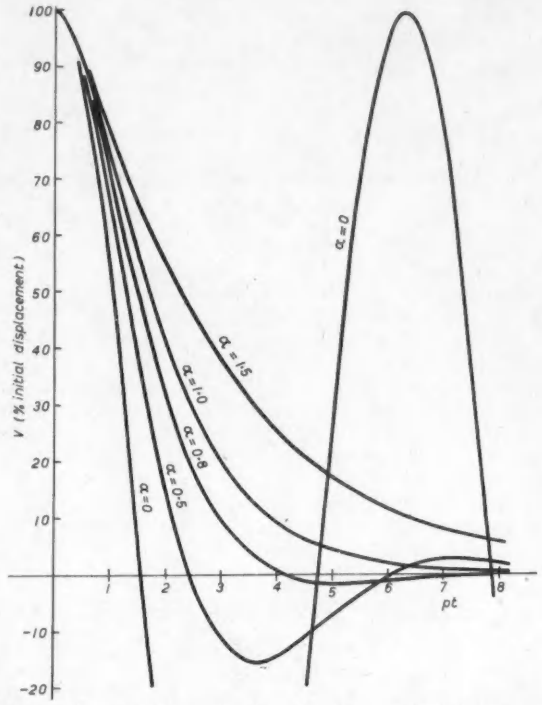


Fig. 5. Recovery of a second order system from an initial displacement for a number of values of damping factor

problem it is assumed that this time delay is so small that it has negligible effect on the operation of the system. The assumption implies that the inductance of the field windings has no significant effect on the performance of the system and thus the energy storage action of this component can, in this case, be neglected.

Energy Storage Mechanisms

It is clear that the motor and other moving parts represent an energy storage element. There is another, less obvious, energy storage mechanism associated with the motor and amplifier. For if the brush arm were forced by some external torque to rotate from its normal balance position the field would be energised and the motor would develop a torque which opposed the movement. It would therefore be necessary to do work in rotating the moving parts slowly through any given angle. If the moving parts were then allowed to return slowly to the balance position, the motor would do work on the device which was opposing its return. Thus the motor and amplifier function in the same way as a spring and together constitute a second energy storage device. The system is therefore of the second order.

Let V = angular displacement of brush arm from the balance position (radians).
V′ = angular velocity of the brush arm (radians/sec).
V″ = angular acceleration of the brush arm (radians/sec²).
g = acceleration due to gravity (ft/sec²).
F/g = motor torque per amp of field current (lb ft/amp).
k/g = friction torque per unit angular velocity (lb ft/radians/sec).
I = moment of inertia of the moving parts (lb ft²).
m = voltage error/radian displacement of the brush arm (volts/radian).

From equation (10) and the definitions of e and m

$$i = KmV \qquad \text{(11)}$$

The torque available for accelerating the moving parts is equal to (motor torque—friction torque) = (FKm + kV′) Then by Newton's second law of motion,

$$V'' = -\left(\frac{FKm}{I}V + \frac{k}{I}V'\right)$$

or writing $FKm/I = p^2$ and $k/I = 2\alpha p$

$$V'' = -[p^2 V + 2\alpha p V'] \qquad \text{(12)}$$

Equation (12) is the equation of motion and it must be solved in order to study the dynamic properties of the system. It is already of the form required for the graphical method of solution and by comparison with equation (7), $Q = 2\alpha V'/p$

Motion Analysis

Let us examine the motion when the system starts from rest with an initial displacement. If k = O, i.e. there is no friction, Q is always zero. The trajectory is plotted in the phase plane by drawing successive small arcs of a circle about a centre D, (Fig. 4) where O D = Q. Since in this case Q = O, D is at the origin, O, and since Q never changes the successive arcs must form a circle about O as shown in curve (a). This closed trajectory represents an oscillatory motion which continues indefinitely. Thus, in the absence of friction, the system is unstable and of no practical use. If viscous friction is present, i.e. $k \neq O$, Q varies with V′ and the trajectory is found to be a spiral. Curve (b) in Fig. 4 is drawn for the case where $\alpha = 0{\cdot}5$ and curve (c) for the case where $\alpha = 1$. Curve (b) represents a damped oscillatory motion in which there are a number of overshoots and curve (c) represents a recovery without overshoot. Fig. 5 shows the response plotted against time for a number of values of α. In this diagram the scale of angular displacement is graduated in percentage of initial displacement and the time scale is graduated in terms of pt. Thus the recovery of all second order systems for which $\alpha = 1$ from any initial displacement is represented by the curve in Fig. 5. The absolute size of the movement at any time depends only on the magnitude of the initial displacement whilst the true time scale depends only on the value of p for the particular system under consideration. The curves for other values of the dimensionless ratio α are similarly universal.

The effect of an externally applied torque on the static accuracy of the control system can be shown by modifying equation (12). Let the applied torque = T/g lb ft and let the static error be ST radians.

Then equation (12) becomes

$$V'' = \frac{T}{I} - [p^2 V + 2\alpha p V']$$

Now in the steady state $V' = V'' = O$ and $V = ST$

$$\therefore \quad S = \frac{1}{p^2 I} = \frac{1}{FKm}$$

Therefore the static error/unit applied torque is reduced as the sensitivity of the system is increased.

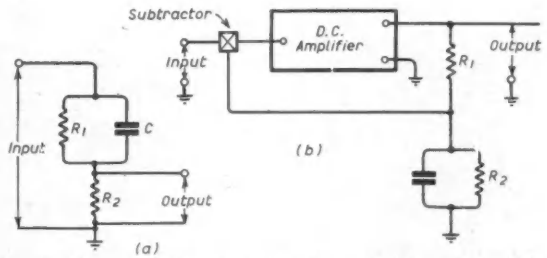


Fig. 6. These circuit diagrams indicate two methods by which artificial damping may be introduced into control systems

The basic parameters to be considered in the design of a system such as this are:

(i) The number and magnitude of the overshoots when recovering from a disturbance (change of input quantity or initial displacement).

(ii) The time required to recover from a disturbance.

(iii) The error caused by an applied torque.

It is usual to choose a value of α in the range 0·8 to 1·0. If $\alpha = 0{\cdot}8$ the overshoot is small and the system will have recovered to within 2% of the initial error in a time t_r where $t_r = 4/p$.

Then $k = 1{\cdot}6Ip = 6{\cdot}4I/t_r$. Alternatively if static accuracy is the main consideration we have

$$k = 1{\cdot}6Ip = 1{\cdot}6\sqrt{I/S}$$

Thus the amount of friction required for good dynamic performance is determined either by the inertia and the required speed of response or by the inertia and the static error/unit applied torque.

Artificial Damping

In practice the amount of viscous friction naturally present is not usually enough to ensure adequate damping. Additional friction can be introduced but this is often inconvenient and it absorbs a considerable amount of motor power. A number of methods of introducing artificial damping are widely used and give very good results. One method is to feed back an additional signal proportional to the rate of change of output quantity. Thus, in the case of our example, the input to the amplifier would be $m(V + bV')$, where b is a constant. In systems in which the output is a mechanical shaft position, the additional feed back term is usually obtained from a tachometer generator coupled to the shaft. The motor torque is then $FKm\,(V + bV')$ and the equation of motion becomes $IV'' = -FKm\,(V + bV') - kV'$.

The additional feedback appears as a further viscous friction term and therefore helps to stabilise the system. In many practical cases the feedback provides almost all the damping, the contribution of friction being negligibly small.

A second method of introducing artificial damping is to modify the amplifier characteristic so that the output of the amplifier is approximately equal to $Ke + K'e'$ where K' is a constant. It can be seen that the term $K'e'$ will contribute a damping term in the equation of motion in just the same way as does the velocity feedback. Two common ways of producing this characteristic in the amplifier are shown in Fig. 6. Fig. 6a shows a simple network which is inserted between two stages of a d.c. amplifier and Fig. 6b a negative feedback circuit which is added to a simple d.c. amplifier. In each case the values of R_1, R_2 and C will depend on the design of the amplifier and on the magnitude of α and p for the particular system.

The use of these and similar circuits is not confined to second order systems; they are also used to eliminate oscillation in more complex continuous systems and in some discontinuous ones.

The method of stabilising a system by modifying the amplifier characteristic is often referred to as "error rate" stabilisation. In the field of industrial process control (such as automatic control of chemical plant) the two terms, Ke and $K'e'$ are respectively described as "proportional" and "derivative" control terms.

In this account of first and second order continuous systems it has been assumed that all the devices obey simple linear laws. In practice this is not true and this fact greatly complicates the theoretical study of such systems. The most common departure from the ideal assumed above is the saturation of the controller output. For example, in the case of the position control system described, the motor torque cannot increase with increasing error voltage indefinitely. The maximum value of the motor torque will be limited either by magnetic saturation or, more probably, by overloading of some part of the amplifier. Other common departures from the ideal state of affairs are the presence of back lash in gear trains and of hysteresis in magnetic devices. Such effects can be included fairly easily in either a graphical or numerical method of analysis (such as the step by step plotting of the phase plane trajectories) but it is difficult to reach general quantitative conclusions. It is outside the scope of this article to discuss these effects in detail but it is important to note that their effect is invariably to reduce the stability of a system. In practice it is often necessary to increase the artificial damping beyond that required by simple theoretical considerations in order to compensate for the harmful effects of these departures from linearity.

The discussion of second order systems has been centred on a particular example of a position control system. It is important to note however that any second order system in which there are only two significant energy storage elements will have an equation of motion of the same form as equation (2) and will respond to a disturbance in the way shown in Figs. 4 and 5.

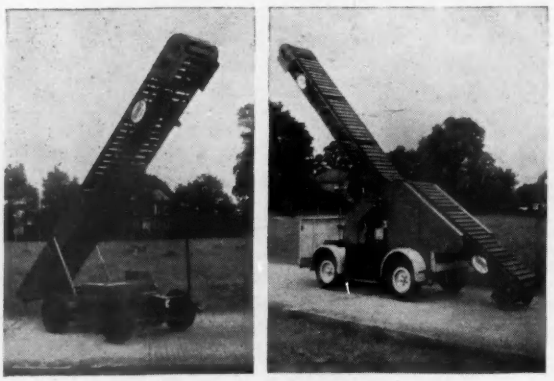
(To be continued. Parts 1, 2 *and* 3 *of this series appeared in our issues of* 1*st April,* 13*th May and* 8*th July, whilst Part* 5 *is to appear shortly.)*

AIRCRAFT BAGGAGE HANDLING

LOADING or unloading passengers' or other baggage on modern aircraft, in which doors are now a considerable height above ground level, requires something special in the way of mechanical handling equipment. Not only must it be mobile to enable aircraft at any part of the ground to be reached, but the conveyor itself has to accommodate the different door heights of aircraft. Such equipment has now been developed by Fourways (Engineers) Ltd., in co-operation with Austin Crompton Parkinson Electric Vehicles Ltd.

Basically, all three models which are normally available are identical, comprising a "Morrison Electricar" chassis on which a variable height boom conveyor track is mounted. In the most elaborate model (Model D), the boom is hinged in two sections allowing the lift of both parts to be adjusted independently of each other. Delivery heights ranging from 5 ft to 14½ ft may be obtained, whilst the loading height can be adjusted between 1¼ ft and 5 ft limits. This model is capable of travelling at 15 m.p.h. over a 30-mile radius. A somewhat cheaper model (E25) is also available which, having a 25 cwt chassis, is capable of 10 m.p.h. over a 20-mile radius. The third model uses a pedestrian-controlled truck.

Models P (left) and E25 show the types of baggage conveyor available



Regent Street regains its Electricity Showrooms

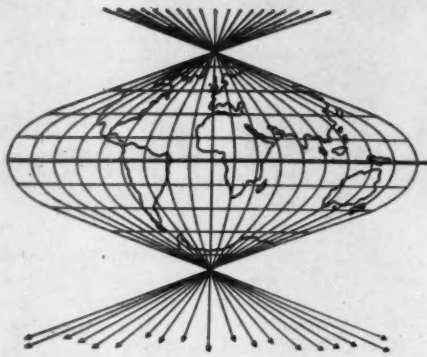
FEW who were associated, either directly or indirectly, with Central London Electricity Ltd. will fail to recall their electricity showroom in Regent Street. Opened early in 1938, this showroom was not only a landmark of shop design, but a valuable display centre for modern electrical developments, and its closing as a result of damage by fire early last year came as a disappointment to many. It is, therefore, pleasing to report that the showroom was reopened a short time ago, after being extensively re-modelled on both floors to the design of Misha Black, O.B.E., F.S.I.A., Alexander Gibson, A.A.DIP., A.R.I.B.A., and John Diamond, B.ARCH., A.R.I.B.A., all of the Design Research Unit.

Basically, the showroom remains unaltered from the design originated by Maxwell Fry, the entrance and circular staircase having been retained. As, however, the L.E.B. had found from experience that the Centre, by virtue of the set back display window, was apt to be overlooked when approached from Piccadilly Circus, this window has now been moved forward parallel with Regent Street. To form the setback to the door, a show case with illuminated "L.E.B." signs facing both ways has been introduced. Internally, the original design provided for the manager's, cashier's and telephone operator's offices on the first floor at the opposite end from the circular staircase. To place, however, the cashier at a position more accessible to both public and staff, this and the telephone operator's offices have been moved to the ground floor, whilst the manager is now located near the head of the staircase. In view of the need to provide for flexibility of display, the whole area on both floors has been kept as open as possible, built-in fixtures having been minimised. A novel feature in this respect is the ground floor arrangement of deliberately incorporating the window display area in that of the whole floor. Thus provision is made for having window displays of considerable depth, when required, or the whole showroom being visible from the street.

Large domestic appliances—cookers, refrigerators and the like—are confined mainly to the first floor, where an area has been provided for demonstrations of cooking and laundering. A single division, however, is formed by a curtained-off section for displaying television and radio receivers with provision for projection t.v. sets. Control of daylight is effected by Venetian blinds, a marked change from the previous arrangement of screened windows and artificial lighting throughout. A feature here, as on the ground floor, is the use of special wallpaper which incorporates the "L.E.B." sign and electrical symbols.

Apart from a section devoted to heavy duty appliances, the ground floor display is given over to small domestic equipment such as kettles, irons, clocks and lighting fittings, and for financial matters. Lighting on this floor is almost exclusively fluorescent, of the indirect type, fittings being arranged above the suspended false ceiling which runs round the outside edge of the room. Three types of lamp have been employed, white (3,500° K black body temperature), daylight and warm white. In the window, however, recourse has been made to direct lighting, tubes being screwed by louvres. By way of contrast, the first floor is illuminated largely by direct lighting from surface or recessed filament lamp fittings. The electrical installation was carried out by the Board's engineers, whilst fittings were supplied by Merchant Adventurers, of London, Ltd., Courtney Pope Ltd., and George Forrest and Son (1950) Ltd.

Two views of the re-modelled Regent Street showrooms of the London Electricity Board. Above is seen the appearance it presents to passers by, the curved staircase and entrance doors being unchanged from the original. The display window, however, has been brought forward to the pavement. The right hand view shows the ground floor interior. The centre pillar is faced with mirror glass



OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Atomic Study

As a further step to enable the Hydro-Electric Power Commission of Ontario to be ready to start building Canada's first atomic power station, Dr R. L. Hearn, the Commission's general manager, and Mr W. T. Bennett, Canada's atomic energy chief, are to visit the U.S.A. next month. There they will study the progress being made on the building of atomic reactors for the production of electric energy. When in Britain in May last, Mr. Saunders, chairman of the H.E.P.C., visited similar plants under construction.

Too Much Water

High water on the Winnipeg River has set back work on Manitoba's McArthur Falls hydro-electric plant at least one month. The delay has been mainly on 3½ miles of dyking work on the west side of the river to hold back the higher levels of Lac du Bonnet which are being raised to give the head required for the plant's maximum 80,000 h.p. capacity. The river at June 30 was flowing at more than 93,000 cu ft a second—the record high flow was 98,000 cu ft in the flood year of 1950. The Lake of the Woods, the principal reservoir, has been regulated at nearly full-supply level for the past month. Work crews, however, have been able to go ahead with installation of turbines and generators in the McArthur Falls power house but high water has been causing trouble in installing the sluice gates. It had been hoped that the station would have been far enough advanced to deliver 40,000 h.p. late this year.

St. Lawrence Ceremonies

10 Aug. is the date fixed for the official ceremony of turning the first sod in Ontario in the construction of the St. Lawrence power project, Mr R. H. Saunders, chairman of the Hydro-Electric Power Commission of Ontario, has said. The ceremony will take place at what Mr Saunders has described as "a very advantageous look-out" point overlooking the power-house site, four miles west of Cornwall. Earlier this month the Commission called its first tenders on the project. Sod-turning on the New York half of the joint international project is to be held the same day as Ontario's, on the U.S. side of the river. First tenders on the New York half have also been invited by the New York State Power Authority—Ontario Hydro's partner in the project. These were for construction of coffer-dams for the Long Sault dam, near Massena. This is the largest of a series which must be built on the two sides of the river. The coffer dams will be used to dry up the bed in the area where the permanent structure is to be raised.

Rural Work

Electrification of an area near Medicine Hat has been approved by the Alberta Power Commission. The work is to be carried out by Rural Electrification Ltd., a subsidiary of Calgary Power Ltd. Maximum cost of the service will be approximately $1,565 per connection, each connection being about 1½ miles apart. The applicants are to pay 15% down, with the balance spread over ten years. Altogether, about 700 residents in the area will be served.

BRITISH GUIANA

Development Proposals

The question of extending electricity throughout the coastal area of British Guiana is now under active consideration. In recent months the matter has come to the fore as the result of a proposal from an outside organisation to be granted a franchise for a large area. Two British engineers, recently visiting the West Indies on work being done for the Trinidad and Tobago Electricity Commission, also paid a short visit to British Guiana, it seems, and were able to assist the Government Electrical Inspector, Mr Paul Skey, with the costing of proposals to be submitted to the Hon. Member for Communications and Works.

EUROPE

Financial Aid

The United States Export-Import Bank has announced that it has agreed to help in financing the sale by the Westinghouse Electric International Co. of a 50,000 kW thermal electric unit to the Compania Electrica de Langreo, of Spain. The Bank's share would be $1,250,000 in the total sale of almost $5,000,000. Westinghouse and Messrs Babcock and Wilcox Co., the principal suppliers, would carry a substantial portion of the credit, according to the Bank. The loan, bearing a 5% yearly interest rate would be repaid in 14 semi-annual instalments, the first of which would be due in approximately two years. The new power plant would double the capacity of Compania Electrica le Langreo's major station located near the City of Oviedo, Spain. Installation would be completed within 30 months and the power from it would help increase the output of coal, steel, cement and other basic materials in the area. It would also help eliminate the company's dependence on rainfall when the drought last autumn cut hydro-electric output.

Loan for Austria

The World Bank has granted a loan of 3,450 million lire and 27 million Swiss francs to Austria to enable the latter to complete the Reisseck-Kreuzeck hydro-electric project. This news has been welcomed in Austria as an important step towards increasing the country's production of electricity and her export of power to Italy. The project, comprising six plants, will utilise water power from an area of 73 sq miles in the southern part of the Hohen Tauern mountains, in Carinthia. The area was first surveyed for this purpose in 1920, and work on the project, begun in 1947, was taken over by the Osterreichische Draukraftwerke A.G. in 1948. Part of the necessary machinery is being supplied by Italian firms. The undertaking, which will be incorporated into the national grid, will have an installed generating capacity of 132,000 kW.

S.W. ASIA

Pakistan's New Plan

Admitting that the development of electric power in Pakistan had been slow, the Minister for Food and Industries has explained that the Central Engineering Authority, which was set up in 1948, had been obliged to devote most of its energies to irrigation problems. It had also been difficult to recruit top level electrical engineers. The Pakistan Government therefore proposed to set up a separate organisation to deal exclusively with electricity problems. This Central Electricity Commission, as it is to be termed, will be an advisory body to the Government, and a precursor of the proposed Power Development Corporation which will be an autonomous body having powers to place electricity development

on a sound basis. In the meantime, the Pakistan Government had decided to appoint consulting engineers to undertake the engineering of major thermal and hydro-electric projects in Pakistan. They have appointed as consulting engineers for the Warsak hydro-electric scheme H. G. Acres, of Canada. Consultants for the Karnaphuli multi-purpose project are International Engineering Co., of the U.S.A., while the consultants for Karachi power station are Brian Colquhoun and Partners, of Gt. Britain. At Karachi a new power station is being built, with two 15 MW steam turbo-alternators initially. It is hoped to have the station in operation late in 1955. Much of the plant being installed is of German manufacture. The project also includes the erection of a 40-mile-long 66 kV transmission line round the districts, for which contracts will shortly be placed. Under plans now prepared the station could be extended by the installation of two 30 MW sets at a later date. The Minister also referred to recent negotiations concerning the appointment of Merz and McLellan as consulting engineers for the Hyderabad power station. In addition, Messrs H. G. Acres are to prepare a power development plan for West Pakistan and International Engineering Co. will prepare a similar plan for East Pakistan.

Damodar Progress

Reviewing the progress of various projects of the Damodar Valley Corporation, Mr P. S. Rao, chairman of the Corporation, has said about 26 MW of power was now being supplied to the coalfields and industrial areas in Bihar and West Bengal. The Konar dam had been completed except for the road-bridge and gates over the spillway, and by the end of this year, the dam would provide water for the Bokharo steam station and for irrigation purposes in West Bengal.

AUSTRALIA

Sydney's Jubilee

Fifty years ago this month, the municipal electricity service in Sydney, New South Wales, commenced operations. As part of the programme commemorating the event, the Sydney County Council held special cookery demonstrations, and has awarded certificates of appreciation to 67 employees who have had 40 or more years' service. A public electricity supply was first given in Sydney when the Lord Mayor started the generator at Pyrmont power house on 8 July, 1904. In the first year 86 consumers were being supplied. The figure has now risen to over 313,000. Up to the end of 1935 the Sydney Electricity Department was owned and controlled by the Municipal Council of Sydney. From 1 Jan., 1936, the ownership and control passed to the Sydney County Council, but in May, 1950, the Electricity Commission of New South Wales was formed to take over control of power stations and main transmission lines, providing a bulk supply to the County Council.

Increased Costs

With the expiry this month of the 10-year agreement between the Launceston City Council and the Hydro-Electric Commission covering the cost of electricity supplied to the Council for its tramways and street lighting, the new increased tariff has come rather as a shock it seems. Over the last 10 years, of course, there have been a big increase in costs of equipment and wage rates, and these are reflected in the new charges. In 1953-54 the charge for street lighting was £9,300. In the coming year it will be about £15,000. Cost of power for trolley buses this year will amount to £7,600 against £4,000 for the past year.

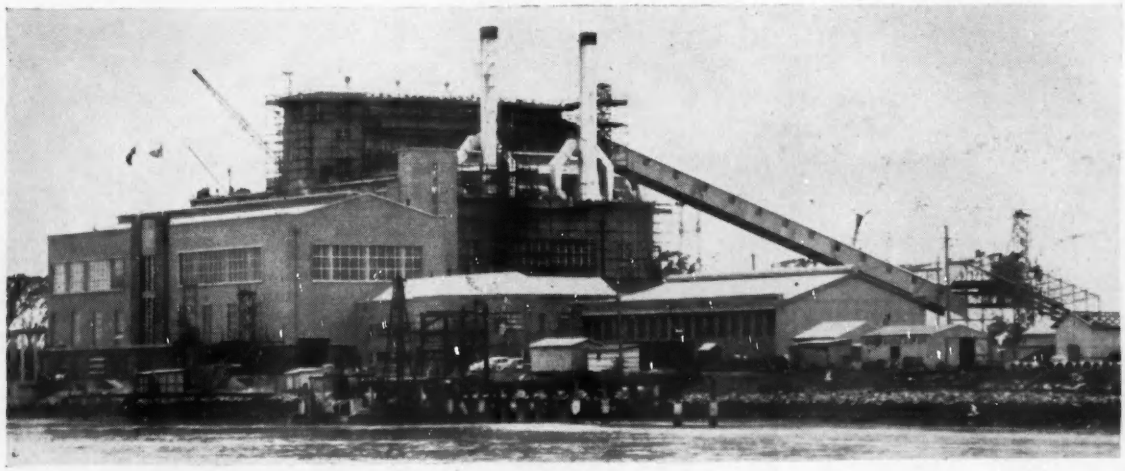
Another of the new power stations in the Dominions is the Bulimba "B" station of the Southern Electric Authority of Queensland, shown below. One 30 MW Parsons turbo-alternator has been in commission for some months, a second is now ready, and a third is on order. Steam conditions at the turbine stop valve are 600 p.s.i., 825° F. There are two boilers per turbine. Present proposals provide for the installation of six 30 MW turbo-alternators, but two more could be added if required. Bulimba "B" power station, which stands half a mile from the "A" station, is built on the reclaimed neck of land now joining Gibson Island to the mainland, about 9 miles from Brisbane. Circulating water is drawn from the Brisbane River, and discharged across the isthmus to Doboy Creek. Work on the station was instigated by the City Electric Light Co. Ltd., which was taken over by the S.E.A. last year. Queensland, by the way, claims to have been the first British colony to have an electricity supply. On 11 Dec., 1882, eight arc lamps in Queen St, Brisbane, were lighted in a demonstration. The following year permanent electric lighting was installed in the Government Printing Offices, Brisbane

NEW ZEALAND

Power and Heavy Water

Agreement has been reached between the New Zealand Government and the U.K. Atomic Energy Authority, to proceed with the project for producing heavy water and power from geothermal steam bores in the Wairakei district of the North Island. Announcing this in Wellington last Thursday, Mr Holland, the Prime Minister, said scientific research and engineering investigations had shown that considerable power could be produced economically from the natural steam. In addition, scientists in the U.K. had been investigating the possibilties of producing, from the same source, heavy water required in certain type of nuclear reactors for producing atomic energy. The same flow of steam could be used economically to produce both the electricity and heavy water. The designing of the dual-purpose plant is to be undertaken in Britain. He said the initial installation would produce an estimated 40,000 kW of electric power, and additions would be made in the light of experience gained. It may be recalled that last year it was officially announced that the plans for producing heavy water from the geothermal steam had been dropped, but exhaustive tests have since proved that sufficient quantities of steam are available for the purpose.

On Thursday last, Mr Holland also said that he expected New Zealand would be producing heavy water from geothermal bores at Wairakei in three years' time. Electric power would probably be generated a year later. Technical experts were still working out the form of organisation needed.



Personalities

IN THE INDUSTRY

Branch manager for the Nottingham area for the Lancashire Dynamo Group, **Mr H. G. Boullen,** B.SC.TECH., A.M.I.E.E., has been appointed home sales manager of Lancashire Dynamo & Crypto Ltd. He will take up this new post on 1 Sept. next, operating from the London office at St. Stephen's Hse, Victoria Embankment. After receiving his education and technical training at Bowden College, Manchester Grammar School and Manchester University, Mr Boullen undertook a works apprenticeship at the Trafford Park Works of L.D.C. Subsequently he joined the sales staff and became Nottingham Branch manager in 1929.

Following the resignation of **Mr D. C. Spink** from the position of manager of the Television Sales Department of the English Electric Co., Ltd, that concern has announced that the activities of its Domestic Appliance Division and the Television Sales Department are to be combined. **Mr H. C. Timewell,** who has headed the company's Domestic Appliance Division for the last three years, will now be manager of the new Division which is to be called "The Domestic Appliance and Television Division." Under the new arrangements, **Mr A. M. Parkinson's** responsibilities as home and export sales manager will be expanded to include television in addition to domestic appliances. The Domestic Appliance and Television sales representatives will continue to cover the territories to which they are at present posted.

Taylor, Tunnicliff and Co., Ltd., announce that **Mr G. H. Gillam,** A.M.I.E.E., has been appointed chief engineer of the company to succeed the chief electrical engineer, **Mr E. D. Spencer,** A.M.I.E.E., who has retired after 30 years with the company. Mr Gillam received his early training at the Rothervale Collieries and Bye-Products Plants of the United Steel Co. and with Metropolitan-Vickers Co. Ltd. at Trafford Park. In 1929 he joined Taylor, Tunnicliff and Co., Ltd., as technical assistant and in 1934 transferred to the firm's London office as engineering assistant to the firm's London director, Mr M. J. Dark, A.M.I.E.E. Mr Gillam serves on many British Standards Institution and Electrical Research Association Committees and is chairman of the Group 25 —Insulators—and of the Insulator Study Committee of C.I.G.R.E. He also served on the Supply Section Committee of the Institution of Electrical Engineers from October 1947 to 1950. For some years past he has been a B.S.I. delegate to the meetings of the International Electro-Technical Commission, and he will take up his appointment at the company's head office in Stoke-on-Trent — immediately after his return from the I.E.C. Meetings in Philadelphia—about 19 Sept.

At Ilfracombe recently, **Mr R. S. Jull,** A.M.I.E.E., the local branch manager to the South Western Electricity Board, was presented with a set of woods from the staff as a parting gift to mark his retirement after nearly fifty years' service in the industry. The presentation was made by **Mr R. Robertson,** district manager. Mr Jull started his career with the Leatherhead undertaking in 1906, and he subsequently served at Chichester, Frinton-on-Sea, Chipping Norton and Cookham prior to becoming engineer and manager of the Ilfracombe Electric Light and Power Co., Ltd.

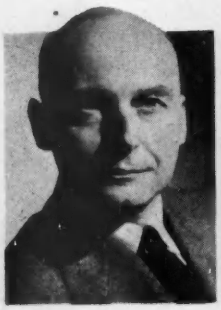
Mr W. A. Reynolds, M.A., A.M.I.MECH.E., has been appointed deputy general manager of the Witton Moulded Insulation Works of the General Electric Co., Ltd, in succession to **Mr A. E. Phipps,** whose retirement we recently announced. Born in Bridport, in 1919, Mr Reynolds was educated at Sidcot School, Somerset. Following war service he entered Emmanuel College, Cambridge, where he graduated, and after serving his apprenticeship with the General Electric Company Ltd, was appointed a planning engineer. He transferred to the Witton Moulded Insulation Works as assistant to Mr Phipps in 1951.

Joseph Crosfield and Sons Ltd. have appointed **Mr F. H. Perrin** as their special representative in the field of water treatment.

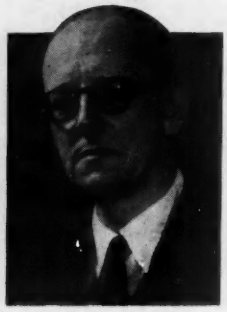
At an informal luncheon at the Savoy Hotel recently, **Sir Harry Railing,** chairman and joint managing director of the General Electric Co., Ltd, presented, on behalf of the Board of the Company, an antique silver fruit and sugar set to **Mr W. H. Williams** who, as we noted on 1 July, retired at the end of last month from the position of director of the company and manager of the Osram Lamp Department.

Sir Harry Railing, left, making the presentation

The Metropolitan-Vickers Electrical Export Co. Ltd. announces the appointment of **Mr C. P. Storr,** M.A., M.I.MECH.E., M.I.E.E., as manager, Dominions Division, as from 1 July. Mr Storr took his degree at Cambridge and went to M-V as a college apprentice in 1928. After working as a relay engineer in Meter Engineering Department he went to India in 1935, joining the head office of Associated Electrical Industries (India) Ltd. at Calcutta. During the war he was seconded to the Indian



Mr H. G. Boullen



Mr G. H. Gillam

Mr W. A. Reynolds

Mr C. P. Storr

Mr H. F. Fordham

Mr J. Allen

Mr L. C. W. Turner

Ordnance Service as Civilian Gazetted Officer, in which capacity he was responsible as works manager for the installation and commissioning of the Kanpur Ordnance Factory. In 1946 he was appointed deputy chief engineer, A.E.I. (India), and he became chief engineer and a director in 1949. In that year he was also made a director of Associated Electrical Industries Mfg. Co., Calcutta. Early in 1953 Mr Storr rejoined Metropolitan-Vickers as power systems engineer, and undertook the organisation of a department to investigate power system problems. Mr Storr has been chairman of the Calcutta Branch of the I.E.E., and has also been a member of the Electrical Plant and Switchgear Sectional Committee and the Transformer Oil and Lubricants Sub-Committee of the Indian Standards Institution.

Mr J. Allen has been appointed manager of the Manchester branch of the Revo Electric Co., Ltd., following the recent retirement of **Mr H. F. Fordham.** Mr Allen has been deputy manager since 1953, and joined the company as senior representative at the Manchester branch in 1946. He held earlier positions with the Electrical Departments of both Southport and Bury Corporations. Mr. H. F. Fordham's retirement concludes over 20 years' service with the Revo Electric Co., Ltd. He was well known in the trade throughout the Lancashire area and has been associated with the Electrical Industry in this country since 1918. He spent six years in Canada and the U.S.A. before the first world war.

Appointed as station superintendent at the Tilbury power station now under construction for the Eastern Division of the B.E.A. is **Mr J. Haynes,** A.M.I.E.E., A.M.I.MECH.E., A.M.INST.F. He is to commence his new duties on 1 Sept. The Tilbury station is designed for an ultimate capacity of 360 MW, the initial installation being three 60 MW sets. Mr Haynes is at present station superintendent at Derby power station.

The deputy superintendent at the new Tilbury power station is to be **Mr L. B. Pearson,** A.M.INST.F., who, since April 1951, has held a similar position at the London Division's Blackwall Point power station. Mr Pearson started with the Bedford Corporation undertaking, and after experience at Letchworth, with British Celanese Ltd., and at Hornsey, went to Brighton where he became assistant charge engineer. He was then appointed to Earley power station where he was efficiency engineer prior to going to Blackwall Point.

Another appointment just announced by the Eastern Division is that of **Mr R. R. Belbin,** ASSOC.I.E.E., M.INST.F., as station superintendent at the Goldington power station now under construction near Bedford. This station will be of 180 MW capacity. Mr Belbin is now station superintendent at the Division's Bedford power station, a position he has held since 1948. Earlier he had served with the Northmet Power Co. at the Brimsdown "A" and "B" stations in various capacities. This new appointment is with effect from 1 Sept.

At present with Crompton Parkinson Ltd., **Mr L. C. W. Turner** has been appointed sales director of Brush Electrical Engineering Co. Ltd. He will take up his new duties on 1 Sept. Mr Turner, who is now manager of Crompton Parkinson's Plant Division in the North West area, operating from Manchester, has been with that concern for the past 22 years. He served an apprenticeship at the Chelmsford Works, subsequently becoming a junior sales engineer of the Plant Division, London, in 1935, and a sales engineer at Birmingham three years later. After war service he rejoined the company as switchgear sales engineer, and was appointed manager of the Plant Division, Belfast, in Jan. 1949. He took up his present position in Manchester in Dec. 1950. In his new appointment, Mr Turner will succeed Mr Rex Bate, M.I.E.E., who, as we reported in our 10 June issue, has joined Enfield Cables Ltd. as sales director.

Mr F. R. Haigh, B.SC.(HONS.), A.M.I.E.E., ASSOC.I.MECH.E., leaves his present position of district engineer, at Walkden, with the North Western Electricity Board, at the end of this month, to take up his new appointment as senior assistant engineer (overhead lines) with the Yorkshire Electricity Board, at Scarcroft, to which we referred on 1 July.

On Tuesday of last week, **Sir John M. Erksine,** a member of the North of Scotland Hydro-Electric Board, unveiled a plaque at Tummel Bridge power station to the memory of the late **Mr George Balfour,** M.P., who was chairman of Balfour, Beatty and Co., Ltd. Paying tribute to the valuable work of Mr Balfour, Sir John said that Mr Balfour founded the firm of Balfour, Beatty and Co., Ltd., in 1909, at the age of 37, and achieved for himself the environment and opportunity in which his great gifts could reach fruition. He went on to command world-wide recognition in the field of electricity. Director and chairman of many companies—building, operating and financing electricity undertakings—he yet found time to undertake the onerous duties of a member of Parliament, serving for 23 years until his death. Tribute was also paid by the Rt. Hon. Thomas Johnston, C.H., chairman of the North of Scotland Board, and by Mr A. H. Bowhill, C.B.E.

OBITUARY

Sir Herbert Williams, BT., M.SC., M.ENG., A.M.INST.C.E., who died on 25 July, aged 69, was vice-chairman of Bennis Combustion Ltd., and had been associated with the electrical industry for many years. He served his apprenticeship at Siemens Bros. Dynamos Works, Stafford, and after experience with consulting engineers, served as electrical engineer with Sir John Norton Griffiths, BT., on contract work. Subsequently he became executive director of the Incorporated Association of Electric Power Companies in 1931, a position from which he resigned late in 1942 owing to the heavy calls on his time. He entered politics around 1919, and became M.P. for Reading in 1924. He afterwards represented South Croydon until 1945 and East Croydon from 1950. During the last war he was a member of the Select Committee of the House of Commons on National Expenditure.

Mr T. W. Allen, chief accountant of the Cressall Manufacturing Co. Ltd., died last week, aged 56.

Col P. A. Gregoire, a recently appointed member of the Central Electricity Board of Malaya—a nominee of the Colonial Development Corporation—was killed in an ambush near Kulai, Johore, on 25 July.

Mr C. F. Davies, B.A., who died recently, aged 83, was an assistant to the electrical engineer of the former L.M.S. Railway until his retirement in 1935. He took a prominent part in the electrification of the Euston—Watford Junction suburban line and in the construction of Stonebridge Park power station. In 1930 he was concerned in the electrification of the Manchester South Junction and Altrincham line, and other large projects with which he was involved were the Barking-Upminster line electrification, the reorganisation of the electrical supply for Crewe works, and the reorganisation of Formby power station.

Earl C. Givens, vice-president of the International General Electric Co., (U.S.A.), died in New York on 20 July.

Mr Gilbert Austin, A.M.I.E.E., director of the Cathcart, Glasgow, firm of electrical and mechanical engineering firm of that name, died on 21 July.

Due to pressure of space our feature "Problems and Practice in Engineering" has been held over until next week.

Equipment for Industry

New All-purpose Furnace

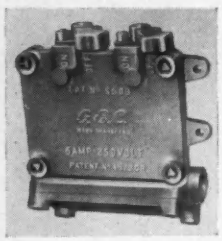
FOR some time now BIRLEC LTD., Tyburn Rd, Birmingham 24, have been manufacturing two ranges of batch furnaces known as their types RP and SA. Type RP was developed to cater for annealing, hardening, normalising, nitriding and other processes and was one of the first furnaces to include elements in the door. Similar in design, the type SA had a system of atmosphere control which made it suitable for clean hardening of tools, dies, gauges and other equipment for which a scale-free finish was essential. Birlec are now producing a new furnace which combines the best features of both types. Made initially in two sizes, 30 kW and 20 kW the range is to be extended later to cater for forges, foundries and other heavy-duty users. To provide uniform heating the nickel-chrome elements are mounted in the walls, door, roof and floor and are contained in slotted bricks which permit easy replacement,

A new feature in the 30 kW size only, is the hearth design, which comprises a number of small plates dovetailed into each other, allowance being made for expansion. The result of this arrangement is that considerably less distortion takes place than with a single plate hearth. In the case of the 20 kW size a divided hearth plate is employed. Atmospheric control, similar to that on the type SA is retained, operating automatically it ensures that the conditions within the furnace chamber remain constant even though the door be opened, since when this occurs, a curtain of flame from an auxiliary supply of air and gas completely covers the entrance. The furnaces are designed to operate at temperatures up to 1050° F and may be supplied with or without the atmosphere control and in the event of its not being required, an extra element is fitted to the inside of the door. To achieve a clean external appearance, transformers, contactors, door opening gear and balance weights are all housed within the furnace-casing, but the equipment is readily accessible since detachable panels are provided. Automatic temperature control equipment is mounted on a panel on the side of the transformer.

Enclosure of the door operating gear and other equipment give this new Birlec furnace a neat appearance

Two-gang FLP Switch

DEVELOPED originally for locomotive manufacturers, a two-gang flameproof switch is now available from the GENERAL ELECTRIC CO., LTD., Magnet Hse, Kingsway, W.C.2, for general use in mining and similar locomotives for change-over control of head and rear lamps or in any hazardous situation where two switches are required in one case. Both switches are flush single pole, one-way, earthed "Landor" types,

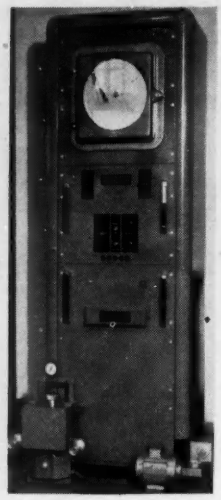


G.E.C.'s two-gang flameproof switch is now available for general use

rated at 5 amp and being of q.m.q.b. operation. External operating handles are completely interlocked with the cover to ensure that neither switches can be closed whilst the cover is off nor cover removed when either switch is in the on position. The terminal chamber is provided with four wiring terminals and is drilled and tapped 1 in. e.t. on both sides, the unused entry being sealed with a solid brass threaded plug. Finished in grey enamel, the switch has been certified for Groups I, II and III gases.

Cable-diameter Controller

A NEW equipment that controls automatically the diameter of extruded cables and records the deviations from the nominal value has been produced by the ADDISON ELECTRIC CO., LTD., 10/12 Bosworth Rd, W.10. The photograph shows the complete equipment which comprises a gauge-head, control cabinet and servo-motor. Information concerning the change in diameter of the cable passed from the gauge-head is recorded on the circular chart in the top half of the cabinet. The variations recorded are converted into signals by the control panel and fed into the servo-motor, which causes the cable haul-off speed to vary such that the diameter is maintained.



Addison's new cable diameter controller comprises control cabinet, gauge-head (lower left) and servo-motor

Heat Control of Roller Surfaces

ALTHOUGH heated rollers, drums and similar moving curved surfaces have been employed for many years in a number of industrial processes, their efficient temperature control has often presented considerable difficulties, particularly where temperature variations are required to be kept within close limits. In a new capillary-type thermostat, however, developed recently by ROBERT MACLAREN AND CO., LTD., Eglinton Works, Kilbirnie St, Glasgow, C.5, the engineer is provided with means of overcoming most of these problems.

Basically, the new thermostat (type ACS/D) comprises a liquid-filled system of capillary tubing connected, at its upper end, to an operating bellows. At its sensing end, the tubing is horizontally coiled to form a pad which, inserted in a copper shoe, can be bent to the radius of the surface and applied to it. Changes in surface temperature are then transmitted by conduction to the capillary tubing, thus altering the volume of liquid within it to alter the position of the operating bellows.

The length of tubing within the shoe may be altered to provide the required closeness of control. Normally, however, a standard length of capillary is employed, giving a control of ±5° F. A standard inoperative length of 12 in. provides means of mounting the head at a convenient distance from the shoe.

G.E.C. Oil Switch

WE have been asked by the GENERAL ELECTRIC CO., LTD., to make it clear that their oil-switch to Draft British Specification CR(ELE)2032, which was described on page 96 of our 15 July issue, is designed to interrupt the normal current only, not the short-circuit current as suggested in the article.

U.V. Rays to Keep Food Longer

HITHERTO applied to retail food stores, sterilisation by ultra-violet radiation is now available for the domestic larder.

PHILIPS ELECTRICAL LTD., Century Hse, Shaftesbury Ave, W.C.2, have now produced their TUV germicidal tube for home use. It brings about the surface decontamination of foodstuffs by exposure to short wave ultra-violet radiation which is lethal to most forms of bacteria. A 6 W tube in a food safe not exceeding 4 sq ft of shelf area will keep meat, sausages, cheese, fruit, salad, vegetables, etc., free from surface decay for periods far beyond normal and will eliminate transference of odours from one food to another.

Philips' u.v. germicidal tube is now available for use in the pantry. It is both inconspicuous and easy to install

Installation is simple, the tube requiring an Edison screw holder taking a supply from the normal 200/250 V a.c. mains. It costs 58s. 6d. and measures 7 in. overall length.

It is recommended that butter and fats should not be stored in close proximity to the tube, otherwise its powerful output of radiation may cause rancidity at close range, and that human eyes should not be exposed to the radiation for excessive periods. Philips point out that the tube will not prevent food decomposing from the inside, it is only intended to prolong the keeping qualities of foodstuffs by protecting their surfaces against mould formation and other decomposition.

Mazda Fairy Lamps Reduced

PRICE of the Mazda Fairy Light Sets comprising twelve ready wired fairy lights attractively cartoned with a spare lamp, has been reduced to 16s. 11d. plus 3s. 1d. purchase tax, say the BRITISH THOMSON-HOUSTON CO., LTD., of Crown Hse, Aldwych, W.C.2.

Trade Publications

LIGHTING.—Siemen's Electric Lamps and Supplies Ltd., 38-39 Upper Thames St, E.C.4, have published a leaflet No. 109/54 on their new spotlight and floodlight fitting for shop and store display fitting.

KNOBS, WHEELS AND HANDLES.—Leaflets issued by the Ray Engineering Co., Ltd., Southmead, Bristol, illustrate and list Pattern 36 black moulded knobs. Pattern 9 Handles and Patterns 33 and 34 moulded plastic hand wheels.

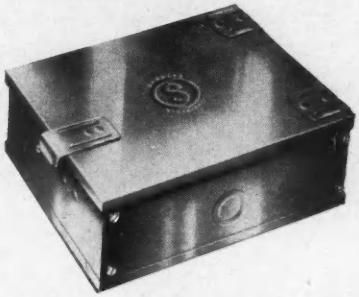
"Sandalita" Steel Case Fuse Units

FURTHER development by WM. SANDERS AND CO. (WEDNESBURY) LTD., Falcon Electrical Works, Wednesbury, Staffs, is the introduction of a long established well-tried unit in a light sheet steel fuseboard case.

Sandalite Duplex type fuse bases giving the choice of a rewirable, B.S. 1361 domestic cartridge or B.S. 88 lag type cartridge (E.E. Co., SS Type) fuses in one common base, are fitted to tilting fuse battens which permit easy wiring of cables (the main cable terminal is well protected) against accidental contact even with neutral shield removed. The neutral mounted on strong porcelain insulator is adequate and robust and has heavy pinching screws for main and circuit cables.

These are fitted into sheet steel cases, provided with knock-outs top and bottom finished in stoved steel hammer grey enamel.

Available in 4, 6, 8, 10, 12, 14 and 16 way models, prices range from 19s. 8d. each (4 way rewirable) to 91s. 4d. (16 way 15 amp tag type fuses).



Simple styling in the new Sandalita casing

New Package for Kub Shaver

A NEW packing case for the Kub-electric dry shaver will be supplied with all new models purchased.

Soundly constructed, with an exterior finished in silver grey embossed Crocodex and a velour flock interior in maroon, the new pack won first prize in a recent Sheffield contest designed to encourage better packaging.

The makers CHILTON ELECTRIC PRODUCTS LTD., Hungerford, Berks, also reveal that the razor itself will in future be obtainable in cream with red or grey side flaps, or in pale grey with dove grey side flaps. The price remains unchanged at 79s. 11d. (inc. p. tax).

Higher Lamp Efficiencies

ANOTHER firm to announce recent improvements in fluorescent lamp efficiencies is CROMPTON PARKINSON LTD., Crompton Hse, Aldwych, W.C.2. These relate to their "natural" lamps, which are stated to produce up to 16% more light in both 880 W and 40 W sizes. Prices remain unchanged, 80 W lamps retailing at 15s. 5d. each and 40 W at 13s. 11d.

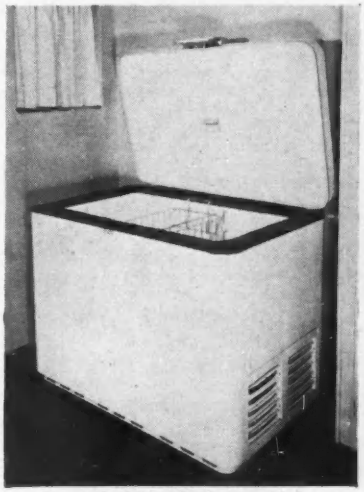
For the Electrical Trade

Store Summer-fresh Food

FARM, garden, orchard and dairy produce kept fresh for months on end is one sales attracting feature of the B95 home freezer which INTERNATIONAL HARVESTER CO., OF GREAT BRITAIN LTD., 209 City Rd, E.C.1, are marketing.

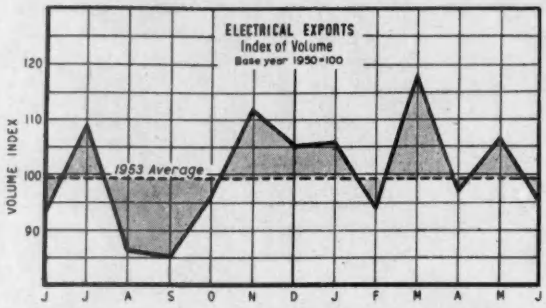
Price of £152 plus £55. 3s. 2d. purchase tax is offset by the saving in time, temper and energy which this unit affords the busy housewife. Designed for household use and capable of storing up to 332 lb food, the IH B95 allows the storing of surplus products of farm, orchard, garden and dairy safely and conveniently for up to 12 months.

Sales pointers for this unit are the ease with which complete meals, snacks and sandwiches can be prepared days or weeks in advance, ready for any contingency. It allows owners to take full advantage of market prices to provide the family's foods all the year round, and to enjoy the delights of out-of-season delicacies.



Frozen food store for farm and home

EXPORTS and IMPORTS



Statistics for June

ELECTRICAL exports fell in volume last month, compared with those of May, as shown by the ELECTRICAL TIMES index of volume. For June it stands at just over 95, as against 106 for May, based on 1950 as 100. The fall, however, is not unexpected due not only to the Whitsun break at the beginning of the month but probably also to the onset of the summer holiday season at its end. In fact, the position this year can be reckoned as considerably improved over that of June last year, the volume index then being 93 for a month without Whitsun.

In value, electrical exports (made up from machinery and other plant, apparatus and appliances) amounted to £13,765,860. It will be recalled that the total given above for electrical exports is that recorded for equipment classified under Class D, Division 16 of the official exports trade account. This total does not include exports of domestic refrigerators and electric washing machines up to 150 lb. net weight, which when incorporated give the total value of exports shown at the foot of the table below.

This total of £14,604,657 compares with £15,556,299 for the month of May and £14,989,424 for April last. In the exports during June, complete electric cookers alone amounted to £86,758 in value and flat irons totalled £54,682. The corresponding figures for the previous month were £74,249 and £70,688 respectively. It is also worthy of note that during the first six months of this year, exports of the goods listed in our table below amounted to £93,327,244 which is £1,519,174 above the 1953 figure. Australia was again our best customer for electrical apparatus in June.

Description	Exports value (£)			Imports value (£)	
	Monthly Average 1952	June 1953	June 1954	June 1953	June 1954
Generating Sets:					
Diesel up to 200 kW	408,225	292,433	411,254		
„ over 200 kW	214,949	113,057	175,163		
i.c. driven	31,920	14,810	11,113		
Steam turbine-driven	143,882	54,793	120,098	52,285	249,915
with other prime movers	31,520	20,759	232,027		
Generators	210,823	221,662	135,189		
„ parts	369,110	488,141	306,510		
Motors	892,465	738,063	796,440	79,981	32,969
Motor starters and controllers	234,035	227,022	170,417		
Convertors and rectifiers	103,602	81,238	60,963		
Transformers	873,260	985,384	822,430	36,656	76,048
Switchgear and Switchboards	1,291,656	1,331,575	1,240,846		
Batteries, primary and parts	212,536	238,520	271,441		
Fluorescent and Discharge lamps	53,194	28,003	65,631		
Other lamps	123,932	90,028	113,995		
Radio and Electronic gear	1,916,241	1,471,830	2,012,975	407,503	692,152
Telephone and Telegraph Plant	1,372,016	1,220,954	1,325,675		
Cooking Appliances and parts	114,943	87,467	166,866		
Space heaters	26,489	11,647	33,515		
Water heaters	32,963	24,897	18,021		
Other heaters and parts	128,498	99,071	128,590		
Welding machinery	86,132	20,852	129,304	6,013	11,057
Signalling and Bell equipment	53,722	65,772	60,144		
Commercial Instruments	135,473	136,421	135,806	53,241	59,400
House Service Meters	147,816	61,375	145,895		
Electro-medical and X-ray apparatus	118,910	100,583	120,134	31,302	55,008
Fans	110,447	104,117	116,222		
Vacuum Cleaners	159,303	126,565	163,020		
Other Appliances and parts	232,481	183,397	278,701		
Portable power tools	112,423	126,676	152,672		
Washing Machines up to 150 lb	443,379*	136,043	250,641		
Power Refrigerators, up to 12 cu ft	565,985	549,597	588,156		
Telephone and Telegraph Cables	746,946	1,104,198	418,342		
Paper-insulated Cables	883,068	892,481	536,517		
Rubber-insulated Cables	622,124	472,423	440,266	5,806	7,080
Winding and similar wires	151,677	144,670	118,035		
Other Cables and Wires	276,939	275,820	288,391		
Accumulators and parts	452,491	311,714	255,727		
Insulating Materials	165,900	89,823	125,300		
Electrical Ware	103,886	55,627	115,808		
All other articles	1,595,762	1,343,777	1,547,774	248,026	761,340
Total	16,051,060	14,195,362	14,604,657	923,813	1,945,009

*Including models of up to 250 lb in weight

NEWS OF THE WEEK

Export Panel to advise B.S.I.

Strong Electrical Flavour among the Group's Experts

A NEW export panel consisting of prominent industrialists actively engaged in overseas markets has been formed by the British Standards Institution. It will advise the B.S.I. on how best it can assist the export trade. This new panel will be under the chairmanship of Mr J. L. S. Steele of I.C.I. Ltd., and we note that among the seven other members, four are from the electrical industry. They are Mr D. Maxwell Buist, export director of B.E.A.M.A., Mr Leslie Gamage of the G.E.C., and current president of the Institute of Export, Mr Hector McNeill of Babcock and Wilcox and Mr J. W. Ridgeway of Edison Swan Ltd. The last two were nominated by the F.B.I. who have given much active assistance, and who recently urged the need for further attention to these considerations.

The past few years have seen a large increase in the volume and range of overseas work connected with standards. The development of national standards in our various markets abroad has, of course, a direct bearing on the activities of manufacturers. Fundamentally, B.S.I.'s task is to limit the necessity for British manufacturers to comply with a variety of different standards in different countries. The Institution must, however, have the best and most informed guidance which exporters can offer in order to do this, and it is with that object in mind that the new export panel has been formed. A practical task for the panel to tackle will be to suggest ways in which the use of British Standards overseas can be promoted, and how the availability of those standards in all parts of the world can be improved. Other members of the Panel are: Sir Ernest Goodale, Mr G. H. Andrew (B.o.T.) and Mr R. L. Wills (London Chamber of Commerce).

M.E.B. identify Their Meter Readers

THE problem of providing meter readers with some suitable means of identification so that householders can be protected against intruders has received a deal of attention from members of the Area Boards and their Consultative Councils. Positive action is now being taken in the matter which should set many minds at rest. At a recent meeting of the Board's chairmen in London, it was agreed that meter-readers and other employees who visit consumers should carry suitable identity cards. Mr W. S. Lewis, chairman, announced last week that the Midlands Board would be implementing that agreement shortly. Each member of the staff concerned would be issued with a signed identity card which will be renewed annually. In addition, meter-readers in the Area are provided with a uniform with the M.E.B. badge stitched to it. Similar arrangements were announced by the E. Midlands Board earlier this month, see our 8 July issue.

Following an Oxford consumer's complaint, the subject was brought up at the latest meeting of the Southern Electricity Consultative Council. This was not the first time it has appeared on the Council's agenda, and it was previously suggested that if in doubt consumers should ask to see the meter book. This was said to be an apparently water-tight system. Identification of meter-readers is also being considered by the London Council at present. The S. Eastern Council is also considering the question and a suggestion that readers should have uniforms was strongly supported. Meanwhile the public are advised to ask for the man's identity card.

EARL'S COURT EXCLUDED FROM ARRANGEMENTS FOR 1955 B.I.F.

IMPORTANT new developments may have been set in motion by the announcement last week that next year's British Industries Fair will be held at Olympia and Castle Bromwich only. In a short statement, Sir Ernest Goodale announced the first stages in the reorganisation of the London section of the Fair. Concentration of the London section of the B.I.F. under a single roof is apparently part of the new B.I.F. Ltd.'s policy of providing a better-planned display on sound financial lines. The more important aspect of Sir Ernest's announcement, however, is the exclusion of Earl's Court. There have been speculations concerning the future of the A.S.E.E.'s Electrical Exhibition, and one suggestion is that it should take place around the same time as the B.I.F. Unofficial comments last March (see our 25 Mar. issue) were that this might be done if the organisers could have Earl's Court at the appropriate time. This now becomes a possibility.

Meeting to Discuss Rural Capital Contributions

S. WALES Electricity Consultative Council is to recommend to the Board that farmers be given the option of paying a capital contribution in respect of new supplies, guaranteeing a minimum consumption, or of partly paying a contribution and partly guaranteeing consumption. This request arises from last weeks' meeting of the Council when a member complained that many farmers could not understand the imposition of capital charges and its differences in various areas. In a letter to the Council, the Board explained there were two main factors governing the charges. It depended firstly on the situation of the locality being supplied, and secondly on the size of the estimated or guaranteed revenue. As these considerations varied, so also did the size of the capital contribution. The Board stated that they were always prepared to consider alternatives if the community guaranteed a higher revenue.

N.I.F.E.S. Strides Towards Greater Fuel Efficiency

CHARGED with providing a service whose aim is eliminating wastage in the industrial use of heat and power, the National Industrial Fuel Efficiency Service came into operation in May this year when the Government adopted the recommendation of the Pilkington Committee to set up a Fuel Advisory Company. Its main work has been to take over and expand the services previously provided by the Ministry of Fuel and Power since 1942, and in the forefront of its campaign has come a twelve page booklet explaining its "Four Way" service.

At a Press conference on Friday, this booklet was introduced to the industrial public by Dr W. A. Macfarlane, B.A., B.SC., PH.D., M.INST.F., the Service's chief executive. He estimated that most firms could attain a target of a reduction of 20% in fuel bills, and as most of the heat wastage occurs in steam transmitting systems, processing equipment and space heating, a substantial proportion of the saving can, it is claimed, be made with little or no capital outlay. Moreover loans of up to £30,000 are available for firms, installing fuel-saving equipment, these being interest-free for two years after the equipment has been installed. Four types of service are available from N.I.F.E.S. ranging from a "First Aid" appraisal by an engineer to full heat and power survey. Apart from "First Aid," these services are charged at £5/engineer day, where appropriate installation of a pass-out turbine may be recommended.

Approved Appliances for Local Authorities

A NEW list of tested and approved domestic electrical appliances for local authority housing has been compiled and published by the Electrical Development Association at the request of the Ministry of Fuel and Power. It is the second such list to be published and replaces that completed in May last year. It must be pointed out that the list is intended for the use of local authorities responsible for housing, and architects, and is confined to those types of appliances which those authorities may provide either as a normal fitment or when required. Accordingly, the list does not contain the numerous types of portable appliances, such as vacuum cleaners, irons, radio sets, floor polishers and electric blankets. The booklet is being sent to local authorities and architects by the Ministry of Housing, but it is not intended that it should be made freely available to everyone, as in fact, its use is limited.

SALESMANSHIP TRAINING

FULL details of the six-month Salesmanship Course organised annually by the Electrical Development Association are given in a 14-page brochure recently published by the Association. The course leads up to the award of the E.D.A. Domestic Electricity Salesmanship Certificate and Diploma, and the Sales Engineer's Diploma. It starts normally on 1 Oct. and applications for enrolment should be submitted by 1 Sept.

RECTIFIER CONVENTION

CURRENT problems concerning the continued increase in rectifier sales of Westalite rectifier equipments were fully discussed at the Convention of the Rectifier Division of Westinghouse Brake and Signal Co. Ltd., which took place earlier this month at Bath. About 60 members of the company's staff took part representing sales, engineering, research and production interests.

Duty-Free Import of Machinery may be Renewed

A RENEWAL of the practice of allowing duty-free entry of machinery into this country in suitable instances is likely following the report the Committee set up in March last year to examine the subject, and submit its findings to the President of the Board of Trade. Chairman of the committee was Sir Henry Wilson Smith, and his report was published last week. Some discretionary system to permit the duty-free entry of machinery was in the national interest, states the report. Broadly speaking, if the Committee's recommendations are accepted, procedure will revert to the situation prior to the Budget of 1952 when the Chancellor suspended duty-free licensing, with two exceptions. These are that the value of the machinery and plant to be imported should not be less than £2,000, and that a consultative committee containing representatives of industry should be set up by the responsible department. It is also recommended that the duty-free import of machinery should be by consignments and that the field of application should not be limited to specified classes of machinery.

Industry as a whole will undoubtedly benefit to a large extent if the Committee's report is implemented, although its implications in the electrical industry may be more limited. At present such plant and machinery is subject to a duty of between 15% and 20%, adding a considerable amount to the importer's bill. Administering Departments (B.o.T. and Ministry of Supply) are urged to apply more flexible rules, so that the general basis of consideration as to whether the machinery is obtainable in the U.K., is likely to be relaxed so that it will cover equipment not readily available in this country. As before, the arrangements will apply to productive equipment, although the inclusion of plant, as well as machinery, is recommended; the difference being that plant is not mobile and machinery is.

We note that the President of the Board of Trade is to be asked in the House of Commons today (Thursday) whether he intends to implement the Committee's recommendations.

OFFICIAL PUBLICATIONS

DUTY-FREE ENTRY OF MACHINERY into U.K. Report of Committee under Sir H. Wilson Smith. (see this page). H.M.S.O. 1s. 3d.

BUILDING RESEARCH. Report of Building Research Board of D.S.I.R. for 1953 (see page 143). H.M.S.O. 3s. 6d.

HIGHER TECHNOLOGICAL EDUCATION. Memorandum by Parliamentary and Scientific Committee. Available from Secretary, 31, Palace St., Westminster. 2s. (see page 149).

Dock Modernisation

ABOUT £425,000 is to be spent on modernising Stalybridge Dock at Garston, Lancashire, the Docks and Inland Waterways Board of Management has announced. The electrical side of the work will include the provision of four electric cranes with a lifting capacity of 7½ tons and eight of between 3 and 6 tons, as well as improved lighting on the quayside. Most of the work is to be put out for contract although the Board is not expected to invite tenders for a little while yet.

Electricity and Gas Industries share Same Wharf

EXEMPLARY co-operation between electricity and gas authorities in the Isle of Wight will certainly lead to great saving in time, labour and money. The two undertakings have combined to use the same wharf now being built in the River Medina at Cowes. The wharf is actually part of a new gas works being built immediately adjacent to the power station. Although the gas works will not be completed for something over two years, the electricity supply industry's need for the wharf is immediate, and consequently it is being completed ahead of the rest of the gas works. Previously, the power station's coal stocks have been brought across the Solent by barge from Portsmouth's power station. At the new wharf common belt conveyors carrying coal from the vessels can discharge either to the gas works or to a second conveyor travelling to the power station's bunkers.

The first B.E.A. collier, s.s. "Polden," berths at the new Cowes (I.o.W.) wharf to be used jointly by both electricity and gas undertakings

New B.E.A. Ship launched

LATEST addition to the B.E.A.'s fleet of sea-going ships, the *Sir William Walker*, was launched at Sunderland recently, from the shipbuilding yard of S. P. Austin and Son Ltd. Sir William Walker, after whom the ship was named, was a member of the Central Authority until his retirement two years ago, and he travelled to Sunderland for the launching ceremony, which was performed by his daughter, Mrs J. D. Peattie.

The re-decorated showrooms of Smiths English Clocks Ltd. at their Gt. Portland St. premises. The company is hoping that wholesalers and retailers will take every opportunity to view the comprehensive range of clocks displayed

Scottish Factory for Another U.S. Electrical Firm

NEWS of the establishment of another American factory in Scotland to be devoted to electrical engineering was given by Mr P. Thorneycroft, President of the Board of Trade, during the debate on Scotland (Employment and Industry) in the Commons last week. The Minister did not mention the company by name but inquiries in Lanarkshire indicate that it is Ranco Ltd., the American-owned Scottish manufacturers of thermostatic controls for refrigerators, air conditioners and cars, at present occupying premises on the Newhouse Industrial Estate in Lanarkshire. They are to move to a large new 100,000 sq ft Government-sponsored factory at Tannochside, Bellshill, in the same county.

Plans for production at the new factory are still in the early stages but it is expected that Ranco will increase their present labour force of about 300 to 1,000 in the next two years and eventually to about 1,400. Ranco were one of the earlier U.S. firms to establish themselves in Scotland, and since their arrival have steadily developed, finding a good market in this country and also doing a substantial amount of business abroad. The latter aspect of their trading is expected to receive particular attention after the forthcoming move.

This new project follows very closely the recent announcement that Sunbeam Electric are planning to set up an even bigger factory at East Kilbride. Thus the development of industry in Scotland continues at a quick rate. Between 1945 and 1953, over 1,000 new factories or extensions were built in Scotland.

Brighton Firm moves to New Premises

ESTABLISHMENT of new factories and moves to larger premises are not confined to Scotland. The Brighton firm of Metway Electrical Industries Ltd, have been expanding fast, and have consequently outgrown their present factory in King St. This building is now being sold and the firm moves shortly to a factory in Canning St, Kemp Town, Brighton 7, four times the size of the old one. The move will take place as from 3 August. We note that there is a separate goods entrance in Hendon St, but more important, and a most fortunate factor, the telephone number remains as before, Brighton 28366.

The new premises were formerly a furniture depository, but we doubt if the previous owners would recognise them now. There are three modern buildings comprising offices, assembly works and finished stores, although all are joined. Present staff directly employed by the company numbers about 150 but this is certain to increase now that larger accommodation has been found. The extent of the increase has not yet been decided.

Another Golf Date

WE note that the Merseyside Area Competition in the E.I.B.A. Golf Championships will be played at Heswall Golf Course on 1 Sept. The major competition will be played during the morning, and a Greensome in the afternoon. Applications may still be submitted to the secretary, Mr S. Roy Gee of 29 Hope St, Liverpool.

Cable Works planned for Southampton

ERECTION of a cable factory at Southampton New Docks is being planned by Standard Telephones and Cables Ltd. Still in the very early stages of planning, not a lot is being said at present, but it is anticipated that the new works will be equipped with the latest machinery and facilities for the production of submarine telephone cable and submerged repeaters. A nucleus of engineers and technicians from the company's North Woolwich factory will start production but the main body of personnel will be drawn from the local population.

A number of factors were involved in the choice of the site for the new works. Southampton's New Docks will of course be ideally suited to accommodate the cable ships, and ample facilities will be available for the direct loading of cable and equipment abroad. The port provides more than adequate rail and sea access, important for manufacture and shipment of this type of cable.

Better Showrooms to meet Increased Demand for Electric Clocks

ONLY a short time ago we reported the fact that sales of electric clocks had increased considerably in the past few months. An invitation to view the modernised showrooms of Smiths English Clocks Ltd., last week, was therefore most appropriate. The re-decorated showrooms at 179-85 Gt. Portland St, London, have been enhanced by modern furnishing and concealed lighting above displays which encompass the room. To mark the occasion, the company invited jewellery wholesalers and store buyers, electrical wholesalers, and representatives of Electricity Boards to view the showrooms on three evenings last week. Particular emphasis is being laid on the electrical industry because the post-war reluctance on the public's part to purchase electric clocks because of the likelihood of power cuts has now passed and sales are stepping up remarkably. We were informed that the jewellery trades' sales of electric clocks were leaping whilst those of the electrical industry were merely rising. Smiths feel that even greater opportunities exist for electrical wholesalers, retailers and contractors, to sell clocks than for the jewellery trade.

The First Half-Century

Mr R. A. Chattock, city engineer, Birmingham, writing on the suggestion that station engineers should exercise supervision over the glow lamps used by their customers: In the interests of the electric lighting industry I consider that the best lamps obtainable should be supplied to consumers on easy terms, say 30% below cost price, subject to the account being paid within a stated time. In this way the cheap and inefficient lamp can be combated. The effect of such an arrangement to the electrical contractors would not be as detrimental as it would appear, as it should be borne in mind that more satisfactory lighting would mean additional consumers and more work to carry out.—*From our issue of* 28 *July*, 1904.

ELECTRICAL INDUSTRIES CLUB IS A POPULAR VENTURE

AFTER six months, the newly-formed Electrical Industries Club has proved its worth, and the monthly informal luncheons are becoming increasingly popular. Meetings are held on the second Tuesday of each month and it is the Club's practice to obtain a speaker either from within the electrical industry or closely connected with it. Members are able to introduce a guest to each luncheon, the cost of which has been agreed at 12s. 6d. a head, exclusive of drinks and gratuities. Annual subscription is £2. 2s. and there is a £1. 1s. entrance fee. We note that consideration is being given to the expansion of the Club's social activities, and members will be asked to give their views on the matter at the annual meeting.

Coal and Gas Boards war over Electricity

THE Electricity Board is sitting in the no-man's-land of a dispute between the Gas Board and the Coal Board about the supply of gas or electricity to 503 N.C.B. houses at Edinstowe and East Kirkby. The N.C.B. refuses to supply gas to their tenants because they are handing over their electricity supply system to the Electricity Board and money will have to be spent first on modernising it. They are not willing to lay on gas at added expense. The Gas Board complains that they are taking full supplies of coke oven gas from the N.C.B. who are restricting their sale of it by that policy.

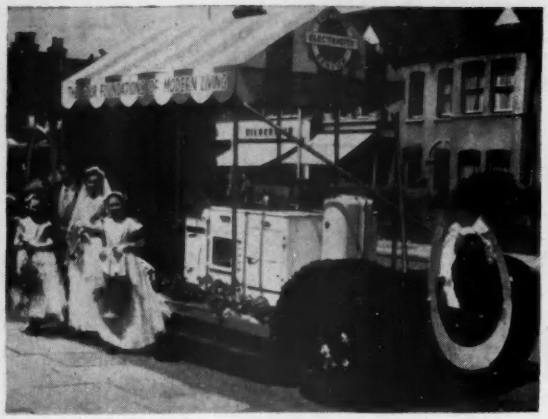
Committee reports on Training Supervisors

THE Committee of Inquiry set up last year to examine the question of Training of Supervisors was published last week. General impression was that a great deal more needed to be done to provide more and better facilities for training, and because of the urgency of the matter the committee recommended that those developments should be speeded up. The present number of supervisors in industry was about 300,000 but well over 10,000 new supervisors would be needed each year.

Conclusions reached were mainly threefold. They were that responsibility lay with management; that training should be related more closely with day-to-day work; and that the status of the supervisor should be examined and his importance as a member of the management team recognised.

Two Shillings Less

IN our review of "Basic Principles in Electrical Engineering," by I. H. Child, which appeared on page 94 of 15 July issue, the price of the book was incorrectly given as 12s. 6d. This should have been 10s. 6d.



Prize-winning float entered by the Eastern Electricity Board's staff at their Dunstable service centre in the recent local carnival. It portrays the characters from one of E.D.A.'s current advertisements on the "Four Foundations of Modern Living." Whilst in procession the wedding group stood before the background of a church door. The entry was awarded first prize

NEWS IN BRIEF

Arrangements for load spreading next winter will be the same as last year. Industrialists and householders will be asked to use supplies sparingly in peak hours.

Results of the Institute of Export's 1954 examinations have just been announced. Ninety-six students passed the First, 105 the Intermediate, and 81 the Final Examination.

Automatic and care-free cooking will be featured on E.D.A.'s stand at the British Food Fair to be held at Olympia from 7 to 18 Sept. Daily demonstrations will be conducted by Miss Marguerite Patten of TV fame.

P. and O.'s new liner *Iberia*, built by Harland and Wolff, Ltd, Belfast, is equipped, like her sister ship, the *Arcadia*, with de-aerating regenerative condensers, closed feed systems and sea-water evaporating plant by G. and J. Weir Ltd.

Regulations to enforce machinery manufacturers to design equipment so as to include essential safeguards to protect operators were recommended at a meeting of the junior group of Birmingham and District Industrial Safety Group.

Committee can study Trolleybus Services

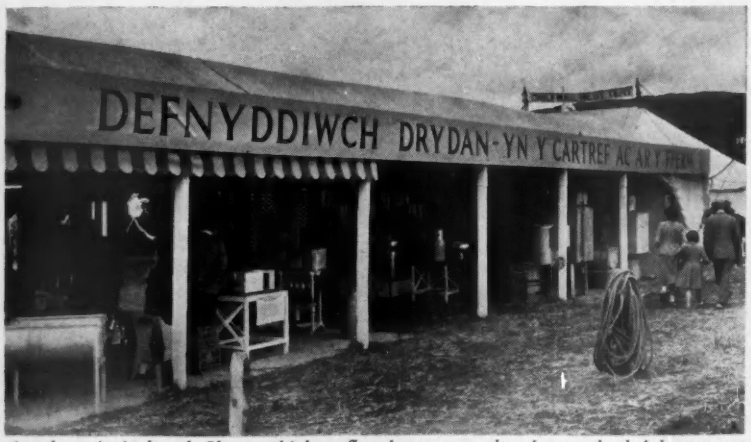
MEMBERS of the Committee which is investigating the efficiency of London Transport are visiting four of the largest cities in Britain to study transport problems there. This course of action is being taken so that the committee can obtain a standard of comparison. Of particular interest no doubt will be the methods employed to cope with rush-hour traffic, but the visits to Birmingham, Manchester, Liverpool and Glasgow, will also provide opportunities of studying trams, underground railways and trolleybuses. Manchester and Glasgow both have trolleybuses and the London committee might pick up some information of value in view of the proposal to scrap those vehicles in London.

TRAINEES FROM CANADA

FIRST two students chosen from applicants from Canadian high schools will arrive at Cable and Wireless Ltd.'s engineering school at Porthcurno in Cornwall next January. They will undergo an 18-month course in telecommunications engineering under a new scheme financed by the Canadian Overseas Telecommunications Corporation. If the experiment proves successful it will be repeated annually for the next five years. The scheme is designed to provide an adequate number of trained engineers needed in the extensive programme which the Corporation has embarked upon. The Porthcurno school has hitherto supplied the engineers to operate Cable and Wireless' 150,000 miles of submarine cable and 200,000 miles of wireless circuits.

Profits Shared

FOLLOWING further trading successes in the financial year ended last March, the directors of Electric Construction Co., Ltd, have announced that the company's profits will be shared among employees at the rate of 1s. 8d. in the pound on wages paid. This applies to all workers in the firm's employ for a full year up to 31 March and still with the company when the shares were distributed on 9 July.



Another Agricultural Show which suffered as a result of our doubtful summer weather was the Royal Welsh at Machynlleth. The electricity stand, organised by EDA and the Merseyside and N. Wales Board, got off to a bad start when prior to the opening, the fire brigade had to be called to pump water from the site

QUESTIONS IN PARLIAMENT

Technological Education

PLANS for the development of higher technological education in Leeds and Birmingham would apply only to work in the Universities and would not include the upgrading of technical colleges, the Chancellor told Mr A. H. Allen last week.

Glasshouse Heating

THE Minister of Fuel said there would be adequate supplies of fuel for glasshouse heating this winter, but he asked that a substantial part of requirements should be taken in coke. He was replying to Sir A. Bossom.

Power Cuts

IN the coming autumn and winter, would the coal situation be such as not to involve any serious electricity power cuts affecting domestic and industrial premises, asked Mr R. W. Sorensen last week. Mr G. Lloyd said it would be absurd to give an absolute assurance in the matter, because it depended on coal production, but the position was being watched closely and everything possible would be done in good time. He hoped that coal production and other measures taken would prove successful.

S. American Trade

CONCERN about the adverse balance of trade between this country and S. America was expressed by Sir H. Williams. He mentioned the fact that our imports amounted to £69,830,000 during the first five months while our total exports and re-exports to the various countries concerned aggregated only £24,413,000. It was explained by Mr P. Thorneycroft, however, that it was not our policy to try and balance trade, or payments with individual countries or groups of countries. It was rather to achieve freer trade and payments arrangements to improve the external position as a whole. The Government would continue to do everything possible to help exporters overcome various difficulties involved in exporting to S. America.

Staff and Expansion of D.S.I.R.

AT present there were 12 staff vacancies at the Chemical Research Laboratory, Mr J. R. Bevins told Mr A. M. Skeffingham in a written answer last week. Nine of those vacancies were expected to be filled shortly and the remainder would probably be filled by recruitment through the Civil Service Commission. Number employed at the Building Research Station on 1 July were 410 full-time and 11 part-time, compared with 397 and 12 respectively on the same date last year.

Replying to Mr F. T. Willey, Mr Bevins said that the Estimates for the current financial year provided for an increase in gross expenditure of £714,402, and in staff of 197. Expansion centred mainly around the Hydraulics Research Station, and the Mechanical Engineering, Road Research and Water Pollution Research Laboratories. Increased provision has also been made for work on promotion of productivity and for grants to European Organisation for Nuclear Research. Work on the new Radio Research Station began this year and was expected to be completed in 1955-56. Mr Bevins also gave the amounts to be spent on each Research Laboratory, and a breakdown of the existing and additional complements of the Department.

Report on Scottish Affairs

THE Royal Commission on Scottish Affairs were understood to be nearing the end of their enquiry, the Secretary of State for Scotland told Mr Woodburn last week. He was unable to say when the report would be submitted, however.

V.H.F. Stations

THE B.B.C. has been authorised to proceed with nine very high frequency sound broadcasting stations giving coverage to 75% of the population of the U.K., Mr D. Gammans announced in a written answer last week. Those stations will be situated at Divis (near Belfast), Holme Moss, Meldrum (Aberdeenshire), North Hessary Tor, Norwich, Pontop Pike, Sutton Coldfield, West Wales and Wrotham. It was hoped to have the first station in the programme, at Wrotham, in regular service by next May. After that stations at Pontop Pike and Divis would be the next, and the remainder would follow at intervals over a period of about 18 months. The TV Advisory Committee had been asked to provide recommendations about further development in V.H.F. sound broadcasting.

Application of Atomic Research

THE Minister of Works assured Mr Ellis Smith last week that the recent publication of papers on the cross-linking of polythene by pile radiation, and on the effect of high energy radiation on long-chain polymers, were approved before delivery by responsible authorities. He added that no licence for manufacturing rights had been granted and no application had been received from any foreign firm (the General Electric Corpn. of America had been named). He also stated that from 1 August the Atomic Energy Authority would receive any income derived from the commercial exploitation of the invention. The Minister explained that when such an invention was considered worth patenting, an application was lodged for the patent and the information distributed. Anyone wishing to take advantage of the invention did so by paying a royalty to Harwell.

Arising from this question, Mr Ellis Smith sought an assurance that no U.K. firm benefiting from Harwell research was collaborating with another company in Germany, Japan or America, but the Minister said he would require notice of that question as he was uncertain on the point, although he did know that a firm in this country was collaborating with Harwell on this invention.

Also arising on the same subject the question was asked whether the U.K. was keeping pace with other countries in the development of atomically driven electric plant, or whether we were being left behind as was the case with hydro-electrification. The Minister said he was satisfied as to our progress in that field, and discussions were always taking place with both the B.E.A. and manufacturers of that type of plant. It was probable that the U.K. was ahead of other countries in this field.

Automatic Train Control

REPLYING to queries on progress which has been made in the installation of automatic train control on British Railways since experiments started after the Harrow train disaster of 1952, the Minister of Transport said that apparatus under trial had shown appreciable improvement during recent months. Though the very high standard of reliability required in safety equipment of that kind had not yet been attained, he added, the Transport Commission intended to extend the trial stretch. Mr A. T. Lennox-Boyd went on to tell Mr G. Nabarro that the Commission had made it perfectly plain that a widespread extension of automatic train control was highly desirable but it was essential that such a system should be wholly reliable.

Summer Recess

PARLIAMENT rises for the summer recess tomorrow (Friday) and is due to reassemble on 19 Oct.

Sayings OF THE WEEK

"If it was not possible to dispense with the revenue from purchase tax, the time might soon come when the Government could consider replacing the reduced yield from the tax by a small retail sales tax, excluding food, and not exceeding 5%"... LORD GRANTCHESTER in the House of Lords.

"For some unaccountable reason the misconception has gained acceptance at home that Germany, Switzerland and the United States virtually have a corner in scientific skill. Nothing could be further from the truth".. Mr C. E. T. CRIDLAND president of the Scientific Instrument Manufacturers Association.

"If there is a scar on my heart it is because they took away my industry and made a mess of it"... SIR ROBERT RENWICK, formerly chairman of the County of London Electric Supply Group, speaking last Thursday.

ELECTRIC SUPPLY NEWS

Douglas (I.O.M.)

Output of electricity from the power station during the year ended 31 Mar. 1954, amounted to 21,439,178 units, an increase of 704,040 units, or 3·4% compared with the previous year. The total of units sold was 19,690,991 of which 495,933 units were for public lighting and the remainder to private consumers.

Compared with the previous year there has been an increase in the sale of current, etc., of £14,480, and a reduction in operating costs of £632, Mr C. Anderson, the borough electrical engineer and manager, reports. Although the gross profit increased from £48,573 to £67,556, the year's operations show a deficiency after interest and sinking fund charges. The deficiency has been limited to £15,274 by the temporary suspension of a portion of the sinking fund payments by Act of Tynwald Court and has been met out of the Reserve Fund. At the end of March last there were 9,385 consumers connected, the average consumption per consumer for the year being 2,045 providing a revenue each of £20. 16s. 5d. Generating plant capacity remained at 11,725 kW, but the station's maximum load increased by 2·2% to 7,000 kW.

Monmouthshire

The B.E.A. has now received the official consent of the Ministry of Fuel and Power to the establishment of a new power station at Rogerstone, Mon. The station will have an installed capacity of 120 MW, made up of two 60 MW turbo generators, each served by a boiler unit having an evaporative capacity of 550 klb/hr. The authorisation includes the construction of two cooling towers, each of 2,250,000 gal/hr capacity.

Nottingham

The City Council's General Works and Highways Committee has been considering the question of selling 19·7 acres of land near Trent Lane, Lenton, to the East Midlands Electricity Board for £2,364. This they wish to exchange for 38·85 acres in the same area which the Council wish to develop during the next five years. Subject to certain conditions, the Corporation are now willing to pay the East Midlands Electricity Board £4,662 for this land, but purchase will not be completed until the Board have raised the land to the level required by filling it with ash from North Wilford power station.

Plymouth

Following protests from Plympton Rural District Council, the South Western Electricity Board has withdrawn its demand for development charges from residents in the rural areas around Plymouth where a mains supply is already in existence. The charges came into operation in April as a revision of the rural line rentals scheme, which we have already noted, but it seems that, by a misunderstanding attempts were made to impose the charges in cases where mains were already within distance. A ruling has now been given that the rural development charge will not apply to any premises which are within the statutory distance of mains existing prior to April, 1954, other than line rentals.

South Wales

In an effort to meet criticisms made against their standard tariffs the South Wales Electricity Board has announced proposed changes which may remove many anomalies. Earlier the Consultative Council suggested that in the domestic tariff, the number of rooms basis should be replaced by a fixed block tariff with consumers paying 5d. a unit for the same number of primary units irrespective of rooms. But as this is at variance with the national policy of the industry it has been rejected. It is proposed, however, to amend the tariff so that a scullery will not necessarily become assessable as a kitchen by the installation of a cooker. In regard to the commercial tariff, based on floor area, consumers with large warehouses may now have the option of separating that part of the wiring so that the office portion of the premises, separately metered, would use the secondary rate of 0·85 d. p.u. Outbuildings of commercial premises may also be assessed under the commercial tariff when used for commercial purposes. The limit available of the maximum demand tariff, both for commercial and industrial consumers, is to be reduced from 20 kW to 5 kW, and the coal price adjustment figure of 38s. per ton for coal is being altered to 60s. It is hoped to have all these amendments in operation by the end of the present financial year.

Upton-on-Severn

Many villages in the neighbourhood of Malvern and forming part of the southern area of Upton-on-Severn Rural Council, will have a supply of electricity by the end of next year. This news was given by representatives of the Midland Electricity Board when they met officials of many of the parishes. The meeting had been called so that the Board's representatives could give a progress report on the rural electrification scheme, which includes the southern area of the Upton rural district, and embraces places immediately outside, such as Redmarley and the district around Staunton in Gloucestershire. The scheme will entail the erection of some 50 miles of high voltage overhead line, some 49 miles of low voltage o.h. line and the installation of about 140 transformer points.

The capital cost of the scheme, it is estimated, will be in the region of £150,000 and when completed will bring electricity within reach of about 900 premises. The Board, it was stated, would bear the cost of the erecting of the interconnector high voltage line between Forthampton and Sledge Green and a backbone high voltage line between Sledge Green and Redmarley.

LIGHTING SCHEMES

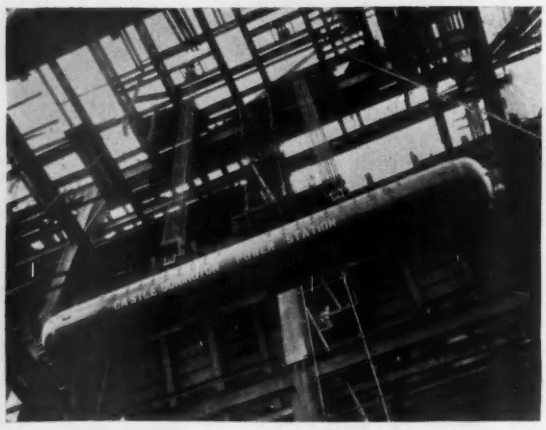
Beddington and Wallington. The Council have received consent to borrow £22,500 to equip all main roads with electric lighting.

Dartford (Kent). Approval has been given for the inclusion in the current year's estimates of the scheme for installation of lighting along trunk road A.2.

Ilford. The Council's programme for improving street lighting up to the end of 1957 will involve the expenditure of over £55,000.

Wigan. The sum of £3,000 is to be spent as part of the programme to convert side street lighting from gas to electricity.

Wirral. The U.D.C.'s lighting committee has recommended that application be made for loans to finance lighting schemes covering a wide area.



At Castle Donington, near Derby, the main drum of Britain's first 830,000 lb/hr boiler was lifted on Tuesday of last week. Castle Donington, in the East Midlands Division, will be the first station to have 100 MW boiler turbine units: it is eventually planned for six such sets. Other details were given in our 6 Nov., 1952 issue

COMPANY ACTIVITIES

FURTHER evidence that 1954 is going to be a bonanza year for the electricity manufacturing industry comes with the sharp recovery in the profits of General Electric Co. Down from £6·6 millions to £4·23 millions last year they have recovered sharply to £5·78 millions before tax. Profits attributable to the ordinary capital have actually doubled from £1·09 millions, to £2·18 millions, and Sir Harry Railing raises his dividend by 1¼% to 12½%. Earnings cover this payment nearly 2¼ times over. The G.E.C. profits include three months of 1954 which is a possible explanation why the increase shows more vitality than those of English Electric, and A.E.I. The recovery in consumer sales got well under way early last year, and G.E.C., moreover, covers a much wider field of consumer goods than either of the other two.

Awaiting the full report one can also hazard the guess that Sir Harry will state that although turnover in some classes of goods is even greater than the pre-recession period, profit margins have been considerably reduced. To keep up the pace the industry now has the new relaxations in hire-purchase restrictions.

Insatiable is the demand of Thorn Electrical Industries for new money to meet the ever-expanding business. Latest is an issue of £500,000 4½% Unsecured Loan Stock 1972/74, but before the issue can be made, consent of the holders of the existing 5½% Unsecured Loan Stock 1959/64 must be obtained. When that has been done, the offer will be made to all shareholders and to holders of the present Unsecured Loan Stock.

The full accounts of Pye Radio provide an interesting example of how the Excess Profits Levy ate into shareholders' earnings. But Pye is an extreme case because it has a highly-geared equity. For the year ended last March group trading profits rose by almost 50% from £956,000 to £1,416,000. After tax and all charges the earnings for the equity amounted to £197,000, or 37½% from which a 20% dividend is to be paid. The details show that the equity earnings have been arrived at after 9 months E.P.L. of £160,000 which means that next time when no such charge is made, similar profits will provide earnings of 68% on the equity and cover the dividend nearly 3½ times.

Mr J. S. Wills, chairman of Broadcast Relay Service, brought out an interesting point which is not perhaps generally realised about the contribution to social stability which its overseas operations give. It now has rediffusion subscribers in very many British dependencies which have brought to the reach of hundreds of thousands of listeners good entertainment in their homes which would otherwise not have been available. Furthermore it has created a link between local Government and the people. Many B.B.C. General Overseas Programmes are rebroadcast including speeches of H.M. the Queen. "Most of these broadcasting services," added Mr Wills in his annual speech to shareholders, "are financed by a system of commercial advertising and all our information is that the programmes are enjoyed by our listeners."—*From our City Correspondent.*

Associated British Engineering Ltd.

The group net profit for the year ended 31 Mar. last is £164,593 after charging taxation etc. The corresponding figure for the previous year was £166,192. The final Ordinary dividend is 5%, making a total of 8% for the year—2% higher than a year ago.

General Electric Co. Ltd.

After the sharp reduction in profits for the year 1952/53, the figures for the twelve months ended 31 Mar. last are a welcome improvement. The aggregate group profit before taxation amounts to £5,777,918, compared with £4,230,234 for the previous year. The consolidated net profit of the group attributable to the holding company, after U.K. and overseas taxation is £2,364,345, as against £1,266,054 for the preceding period. The final dividend is increased by 1¼% to 8¾% making a total of 12½% (*11¼%*) for the year In addition to the foregoing figures, £468,823 net profit relating to previous years has been brought into the group profit and loss account, compared with £2,827,033 the previous year, of which £2,420,172 arose from the settlement of the group's liability to Excess Profits Tax.

Johnson and Phillips Ltd.

Arrangements are being made to provide additional capital. There is to be an issue of 250,000 4½% £1 Cumulative Redeemable Preference shares. It is understood that the shares will be placed privately at a price which should get 19s. net per share to the Company.

Mather and Platt Ltd.

The interim Ordinary dividend is again 4%, but this does not apply to the £1,363,660 new Ordinary shares resulting from a two-for-three scrip issue which was approved at last week's extraordinary meeting. At that meeting approval was also given to the proposal to raise the authorised capital from £2,500,000 to £6 millions.

Nigerian Electricity Supply Corpn. Ltd.

With a final dividend of 4% plus a bonus of 2%, the total distribution for the year ended 28 Feb. last is again 10%. The net profit, before taxation, is £111,044 which compares with £143,304 for the previous year.

Parmiter, Hope and Sugden

Although the net profit for the year to 31 Mar., at £31,578 is about £6,000 lower than for the previous year, the dividend is increased by 4½% to 30% (*25½%*), with a final of 22½% (*18%*). It is proposed to repay the 5% Cumulative Preference £1 shares, of which £30,563 is in issue.

Davey Paxman and Co. Ltd.

This subsidiary of Ruston and Hornsby Ltd., is raising its dividend for the year ended 31 Mar. last from 15% to 25%. Trading profit, after charging working and management expenses, providing £96,431 (*£84,319*) for depreciation, a further £20,000 for increased cost of plant replacement and including £60,296 (*£73,564*) in respect of previous contracts, amounts to £788,636 compared with £658,941 a year ago.

Richardsons, Westgarth and Co. Ltd.

With a higher group trading profit for the year to 31 Mar. last, the dividend is maintained at 15% on the increased capital. After providing for depreciation, the gross profit for the year amounted to £1,013,346 against £811,839 for the previous twelve months. With higher taxation charges, however, the net profit is reduced to £363,022 (*£346,289*).

John Thompson

Referring to the capital needs of this group of combustion and general engineers, Mr Edward Thompson, chairman, says that about £850,000 will be raised by the one-for-three rights issue at 15s. per 5s. share. Of this, some £463,134 will be absorbed by the purchase of B.V.C. Industrial Constructions and a controlling interest in E. Leonard and Sons, of Ontario, Canada. The balance will augment the working capital of the group generally. At the date of the last balance sheet, £651,747 was due to the bank, cash in hand amounted to £334,762, and investments were listed at £526,431. Now that the post-war reconstruction programme has been largely completed, Mr Thompson anticipates a normal annual capital expenditure of at least £150,000. But it may be necessary over the next few years to spend considerable sums in modernising and improving the plant of the new Canadian subsidiary. The increase in the nominal capital by £1 million is in order to make full provision for future additions and alterations in the capital structure as may be necessary.

Thorn Electrical Industries Ltd.

The directors propose to issue £500,000 4½% unsecured loan stock 1972/74. The issue requires the consent of the holders of the existing 5½% Unsecured Loan Stock 1959/64 and subject to this being obtained at a meeting on 6 Aug., an offer will shortly thereafter be made to all shareholders and to holders of the existing Unsecured Loan Stock.

Dividend Declared

Electric Furnace Co., Ltd. Final dividend 6½%, making 10% (*12½%*) but on capital increased by 100% scrip issue.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

30 July—Blackburn R.D.C. Pumping plant in duplicate for part 2 of Eccleshill sewerage scheme.—See 15 July issue.

30 July—Taunton T.C. Sewage and storm water pumping plant, etc.—See 10 June issue.

30 July—Wigan T.C. Wiring in shops and flats at Logwood Junction.—See 22 July issue.

31 July—Belfast. Installation in St. Patrick's Training School.—See 1 July issue.

3 Aug.—Downpatrick. Electrical work in 80 houses in district. T. M'Lean, Council's Architect, Irish St.

5 Aug.—Belfast T.C. Installation in bakery school.—See 8 July issue.

5 Aug.—Kingston-on-Hull T.C. Installation at Thanet county primary school infants' dept.—See 15 July issue.

5 Aug.—Southampton T.C. Installation in Harefield junior and infants' school.—Advertised in 15 July issue.

5 Aug.—Sunderland T.C. Electrical extensions at Monkwearmouth grammar and Fordhall special schools. Borough Engineer and Surveyor, 27 Fawcett St. Deposit £2. 2s.

6 Aug.—Heckmondwike U.D.C. Installation in old people's dwellings in Strawberry Sq.—See 15 July issue.

6 Aug.—Swansea T.C. Installation at Fforest Hall primary school.—Advertised in 22 July issue.

7 Aug.—Inverness. Electrical installation in erection of 24 houses on Beauly scheme. Applications to James Shankley, quantity surveyor, 2 Ness Walk.

7 Aug.—Pwllheli T.C. Installation for auditorium of Town Hall.—Advertised in 8 July issue.

9 Aug.—Dublin T.C. Telephone cables with accessories, etc., for Public Lighting Dept. Finance Dept., City Hall.

9 Aug.—Kidderminster T.C. Lighting and power installations, in the Retail Market, High St.—Advertised in 8 July issue.

10 Aug.—Blackpool T.C. Steel poles, brackets, bases and cast finials.—Advertised in 22 July issue.

11 Aug.—Londonderry. Electrical installation in Model primary school. A. T. Marshall, Princes Quay. Deposit £8. 8s.

11 Aug.—Middleton T.C. Supply and erection of 20 sodium discharge lighting units in Class A along Hollin Lane. Borough Engineer and Surveyor, Town Hall.

11 Aug.—Romford T.C. Supply and/or erection of ten sodium vapour Class A and 369 class B concrete columns and lanterns for street lighting conversion. Borough Engineer, Town Hall. Deposit £2. 2s.

12 Aug.—Harrow T.C. Supply and installation of 247 140 W sodium lamps, lanterns and control gear for improved Group A lighting in certain roads. Borough Engineer, J. H. Melville Richards, Council Offices, Uxbridge Rd, Stanmore, Middx. Deposit £2.

12 Aug.—Manchester T.C. Electrical installation in 30 houses and cottage flats at Blackley, and 98 flats at Wythenshawe. Director of Housing, Town Hall. Deposit £1. 1s.—Advertised in this issue.

13 Aug.—Belfast T.C. Replating cells of storage battery at East Bridge St station.—Advertised in 22 July issue.

14 Aug.—Dagenham T.C. Group B street lighting units etc. in 10 roads.—See 22 July issue.

14 Aug.—Failsworth U.D.C. Supply and erection of 48 street lighting columns, class A standard, with sodium discharge lamps, lanterns, etc., in Broadway. Engineer and Surveyor, Town Hall. Deposit £1. 1s.

14 Aug.—Southport T.C. Supply and erection of complete automatically operated electrically driven vertical spindle axial flow-type pumping unit for Crowland St station. Acting Borough Engineer, Town Hall. Deposit £2. 2s.

16 Aug.—Bradford T.C. Electrically driven vertical spindle centrifugal pumps for two stations at Tong.—See 22 July issue.

16 Aug.—Denton U.D.C. Street lighting conversion units for attachment to existing gas columns.—See 15 July issue.

16 Aug.—Manchester T.C. Installation at Poundswick grammar school.—Advertised in 15 July issue.

19 Aug.—Belfast T.C. Boiler feed pumps for first extension of Power Station West.—Advertised in 1 July issue.

20 Aug.—Esher U.D.C. Removal of ram pump and installation of electrically-driven float-controlled 6 in. diameter centrifugal pump, at Cobham sewage disposal works. Engineer and Surveyor, Council Offices. Deposit £1. 1s.

20 Aug.—Neath T.C. Supply of group A lighting, including steel and concrete columns, all equipment and wiring along about 3½ miles of trunk road A.48. D. Bailey, Borough Engineer, Gwyn Hall, Neath. Deposit £2. 2s.—Advertised in this issue.

21 Aug.—Castlebar (Eire). — Numerous items of machinery for Machinery Yard.—See 22 July issue.

23 Aug.—Louth (Lincs.) R.D.C. Supply and erection of two electrically operated booster pumps and auxiliary equipment in Horncastle Rd pumping station. Consulting Engineers, J. H. Haiste and Partners, 4 Queen Sq, Woodhouse Lane, Leeds 2. Deposit £2. 2s.

23 Aug.—Spilsby (Lincs.) R.D.C.—Centrifugal pumps and ejectors for crude sewage, with electric motors, switchgear, etc. at eight pumping stations.—See 22 July issue.

25 Aug.—New Mills (Lancs.) U.D.C. Conversion of 110 gas street lamps to electricity etc.—See 22 July issue.

25 Aug.—Wandsworth B.C. Repair of about 700 time switches.—Advertised in 15 July issue.

27 Aug.—Leeds T.C. Electrically-driven multi-stage centrifugal pumps with electric motor and switchgear.—See 8 July issue.

27 Aug.—Leeds. Underground cables and lighting at Castle Hospital, Cottingham.—See 22 July issue.

30 Aug.—Leeds. Installations at Scalebor Pk Hospital, Burley-in-Wharfedale.—See 22 July issue.

30 Aug.—Ramsbottom U.D.C. Concrete columns and other equipment for sodium lighting in Bridge St.—See 22 July issue.

3 Sept.—Co. Tyrone. Installation at Dungannon secondary intermediate schools.—See 8 July issue; closing date has been altered.

13 Sept.—Dublin T.C. Electrical installation in Technical School for Girls in Crumlin Rd. Sean Mulcahy, consulting engineer. 70 Merrion Sq. Deposit £5. 5s.

No date stated—Aberdeenshire. Installation of electricity at five schools.—See 15 July issue.

No date stated—N. of Scotland H. E. Board. Lighting, heating, etc. at Quoich power station.—Advertised in 22 July issue.

No date stated—Stone U.D.C. Installation at "The Radfords," Longton Rd.—See 22 July issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Duplextra" portable sander, makers of? E.E.B.—Electrona Electrical Products Ltd., Islington Mill, James St, Salford 3.

"Sunbeam Mixmaster," address for?—E.E.B.—Sunbeam Electric Ltd., 17 Dover St, W.1.

"Minifon" recorder, makers of? S.B.C. Minifon (Great Britain) Ltd., 19 Gt Winchester St, E.C.2.

Houser portable woodworking machine, makers of? S.B.—This refers to a routing machine used for cutting into stair treads such as made by S. N. Bridges and Co., Ltd., Parsons Green Lane, S.W.6.

"Vitrex Fusemaster" fuse-wire carrying screwdriver, suppliers of? H.G.—L. J. Hydleman and Co., 206 St. John St, E.C.1.

Commercial type fruit juice extracting machines, makers of? J.C.—Charles Styles Ltd., New Bond St, Birmingham 9, and very much larger machines are made by Wm. Brierley Collier and Hartley Ltd., Boro Works, Bridge St, Rochdale; Ed. Wilson and Son, Ltd., Aintree Rd, Bootle, Liverpool.

ANSWER WANTED

Electrically-heated glue-pot with the name missing, marked Cat. No. 263 and Serial No. L56188 230 V 1·8 amp, makers of? T.B.C.

No date stated—West Lothian. Installation in junior secondary R.C. school at Bo'ness.—See 22 July issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

20 Aug.—India. Supply of total of 43,600 yd of V.I.R. taped and braided single core h. and l.t. cable for Director-General Supplies and Disposals, Shahjahan Rd, New Delhi. Tender No. SE-3/20268-E/IV. B.o.T. (Ref.: ESB 17466/54).*

24 Aug.—Pakistan. Supply of 56 transformers of 10-200 kVA ratings under tender No. ENGX/2/31598/31605/54 for Dept. of Supply and Development. Govt. of Pakistan, Karachi. B.o.T. (Ref.: ESB 17472/54).*

26 Aug.—Persia. Supply of sawmill and accessories, including 13 electric motors, conveying equipment, 3 diesel electric generating sets, etc. Tender No. 430-92182-4333. Procurement Office: USOM/I. Lalezar-Now Ave, Teheran. B.o.T. (Ref.: ESB 17212/54)*

26 Aug.—N. Rhodesia. Town Clerk, Kitwe, invites tenders for supply of cable, switchgear and transformers. Documents from Town Engineer, Municipal Offices, P.O. Box 70, Kitwe, or Thornton, Maggs and Keeble, consulting engineers. P.O. Box 1834, Salisbury. Deposit £1. 1s.

30 Aug.—Formosa. Tenders (No. 358-H) invited for supply of switchboards, transformers, capacitors, cable and potheads. Central Trust of China, U.S. Aid Div., 96 Po Ai Rd, Taipei, Taiwan. B.o.T. (Ref.: ESB 17071/54).*

30 Aug.—India. Supply of line materials and equipment for distribution lines in N. Gujarat electric grid scheme. Accounts Officer, Electric Grid Offices, Mercantile Bank Building, Fort, Bombay. Rs.15 per copy.

2 Sept.—Pakistan. Supply of control panels for Maithon left and right bank substations in Damodar Valley Corporation scheme. Tender No. ED-718/1. Chief Electrical Engineer of Corporation, Anderson House, Alipore, Calcutta, 27. Deposit Rs. 10.

7 Sept.—New Zealand. Post and Telegraph Dept., Wellington, requires supply of 58 electric fans and 300 heaters. Tender No. P. and T. 150/716. B.o.T. (Ref.: ESB 17679/54).*

7 Sept.—Pakistan. Supply of 72 kW water turbine and generators, control panel and switchboard, and spare parts. Tender No. ENG.X/30802/54. Director-General of Supplies and Development, Frere Rd, Karachi. B.o.T. (Ref.: ESB 17249/54).*

8 Sept.—Iraq. Tenders (No. VIII/8) invited for supply, construction, etc., of pumping plant for electrical pumping station at Washash, including transformer, lighting, pumping units, etc. Development Board, Ministry of Development, Baghdad. B.o.T. (Ref.: ESB 17283/54).*

10 Sept.—Australia. Supply of 1,300 bracket type street lighting lanterns with 100 spare refractors, and 200 suspension lanterns with 20 spare refractors, for Brisbane City Council. Copies of specification (No. E21/54) from Chief Engineer and Manager, Dept. of Electricity, Kelvin Hse, Adelaide St, at 10s. 6d. each.

22 Sept.—Egypt. Supply and installation of 600 h.p. electrical generating set for Beni Souef station. Municipalities Administration, Ministry of Municipal and Rural Affairs. Documents at £E.3. B.o.T. (Ref. ESB 17100/54).*

27 Sept.—Tangier. Water and Electricity Supply Board requires 4,000 kg. of uncovered copper cable. B.o.T. (Ref.: ESB 17048/54).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 27 July

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	236	−3½	252
„ (3 months)	235	−2½	—
LEAD, refined pig, min. 99·97% purity (cash)	94½	−1½	94½
„ (3 months)	93½	−1	92½
TIN, refined, min. 99·75% purity (settlement)	750	−9	572
„ (3 months)	747	−5	572
ALUMINIUM, ingots 99-99·5%	156	—	150
ZINC, virgin, min. 98% purity (cash)	75½	−2	74½
„ (3 months)	76½	−1½	74½
RUBBER No 1, RSS, spot (per lb.)	20⅝d	+⅛d.	19½d.
„ c.i.f. basis, ports, Sept. (per lb.)	20⅛d.	+$\frac{1}{16}$d.	19⅝d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	—	50½
Mild Steel Tape (0·014 in.)	40½	—	40

Gazette Announcements

COMPANIES ACTS

Brocks Refrigeration Ltd., of Newcastle-on-Tyne. Petition presented on 5 July, and winding-up order made on 19 July.

Electro Plant Ltd. Last day for receiving proofs in respect of intended dividends, 11 Aug. Liquidator is C. A. Harrison, 23 Cheapside, Bradford.

Wembley Electrical Appliances Ltd. Fourth and final dividends of 11½d. in £ payable at office of Official Receiver, Inveresk House, Strand, London, W.C.2, on 10 Aug.

Premier Electric Services Ltd. Meetings of creditors and members will be held at offices of A. C. Palmer and Co., C.A., Court Chambers, Friar Lane, Leicester, on 23 Aug. at 11 a.m. and 11.30 a.m. respectively.

Phillips Electrical Supplies Ltd. Meeting of members will take place at the Church Inn, Dukinfield, Cheshire, on 25 Aug. at 8.30 p.m. to receive liquidator's report.

BANKRUPTCY ACTS

Dividends

Gt. Yarmouth. Harry W. Daldry, electrician trading at 168 Bells Rd, Gorleston-on-Sea. Supplemental dividends of 5s. in £ payable at Official Receiver's Office, Castle Chambers, Opie St, Norwich, today (29 July).

Release of Trustees

Grimsby. Kenneth G. Rudd, radio and electrical contractors trading at 4, Commercial Rd, Louth. Trustee was L. F. McCulloch, C.A., 26 South St, Mary's Gate, Grimsby.

Walsall. Cyril G. Clews, trading as Clews Electrical Co., at 226, Stafford St, Walsall. Trustee was R. F. Bendal, C.A., 126, Colmore Row, Birmingham.

Intended Dividends

Hastings. James H. Thompson and Henry A. Why, trading together as Southern Radio T.V. Electrical Services, at 52, Wellington Mews, Hastings. (Also separate estate of J. H. Thompson.) Last day for receiving proofs, 5 Aug. Trustee is E. C. Sherwood, Official Receiver, 8, Old Steine, Brighton.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Baroness. 727,371. Class 7. Washing machines. 727,372. Class 11. Specification includes refrigerating apparatus. Easiclene Porcelain-Enamel (1938) Ltd., Victoria Works, Booth St, Darlaston, South Staffs.

Magnetrol. 719,891. Class 9. Voltage and current stabilisers, rectifiers, battery eliminators, battery chargers, etc. Winston Electronics Ltd., 1 Park Rd, Hampton, Middx.

Autocrat. 728,262. Class 11. Lamps for vehicles. Excelsior Motor Co., Ltd., Excelsior Works, Kings Rd, Tyseley, Birmingham, 11.

Ovacore. 729,851. Class 17. Inflatable tubing for use in moulding concrete and the like materials. Ductube Co., Ltd., 235/241 Regent St, W.1.

Dexathene. 729,863. All goods. Class 17. Dexine Rubber and Ebonite Ltd., Coldwall St, Rochdale, Lancs.

Endolac. 730,522. Class 17. Insulating varnishes. Pinchin, Johnson and Associates Ltd., 4 Carlton Gdns, S.W.1.

Contracts Placed

Ryton-on-Tyne U.D.C. Installation in 61 houses on Park Field North estate, Tindall, Son and Telford.

Stretford T.C. Supply of lanterns and steel poles for improved group A street lighting, Metropolitan-Vickers Electrical Co., Ltd., £3,834.

Peterlee. Electrical installation in 144 houses at Acre Rigg for Development Corpn., G. M. Pearson and Sons.

Middlesbrough T.C. Supply of materials for 12 months: lamps and unit dry cells, A. Jones and Co. Ltd., and A. Marshall (Middlesbrough) Ltd., street lighting columns, Stanton Ironworks Ltd.

Newcastle-on-Tyne T.C. Fluorescent lighting equipment, A. E. Dees Ltd, £1,255; and sodium lighting equipment, same, £1,110 .

Stoke-on-Trent T.C. Fluorescent street lighting along five roads, Revo Electric Co. Ltd, £2,251.

Kendal T.C. Installation in 54 dwellings on Hall Garth estate, L. Barker, £1,382.

London. Manufacture, installation etc., of electric lifts on Devons estate Poplar, Express Lift Co., Ltd, £6,063; electrical installation at Royal Hill primary school, Greenwich, Buchanan and Curwen Ltd, £2,628.

BUSINESS PROSPECTS

Home

Alton (Hants) R.D.C. Erection of 30 dwellings at Church Fields, Headley. Engineer, Council Offices, Barton End, Alton.

Aveley (Essex). It is proposed to build 14-unit factory in two blocks on Aveley estate at estimated cost of £59,000.

Banffshire. Twenty houses to be built at Gardenstown, 12 at Whitehills, 18 at Portgordon, 10 at Parkmore, 6 at Glenhirst and 4 at Drummuir.

Birmingham T.C. Council recommended to prepare plans for 3,334 dwellings, 270 permanent shops, 50 temporary shops, etc., on various sites in next year's housing programme. Total cost estimated at £8,011,488.

Bournemouth T.C. Erection of new police headquarters in Madeira Rd. Borough Architect, Room 106, Town Hall.

Bradford T.C. Construction of infants' school at Shirley Manor, Wyke. City Architect, Town Hall.

Carlisle. S. Mann and Partners, Lowther St, have prepared plans for car showrooms and offices in Lowther St for W. Lightfoot.

Carmarthenshire. Erection of county police headquarters at Friar's Pk. W. T. Lloyd, county architect, County Hall, Carmarthen.

Croydon T.C. Planning applications submitted for permission to build 1,400 council houses and/or flats with schools, etc., at Addington, and also to develop 90 acres (850 dwellings) in Lodge Lane near New Addington estate.

Darlington. Plans approved by R.D.C. for 390 houses at Newton Aycliffe for Development Corporation.

Exmouth. Plans to be prepared for new building at Rolle College. Cost estimated at £200,000.

Falkirk. Dean of Guild Court has approved plans for block of offices at Bainsford, for British Aluminium Co., Ltd. Estimated cost £85,000.

Greenwich B.C. Construction of 88 dwellings on Coldbath St site Borough Engineer and Surveyor, Town Hall.

Kerry (Eire) Sketch plans approved for two-storey technical school at Causeway.

Liverpool. Factory in Brookfield Drive and Atherton Rd, Fazakerley, proposed by Lovell and Christines Ltd., of West Smithfield, London, E.C.1. Plans are by T. M. Alexander and Son, 60 Castle St, Liverpool.

Maidstone. Autometric Pumps Ltd. are planning singe-storey extension at Waterside. Also Kent Engineering and Foundry Ltd. are to extend their Phesnit works in Church St.

Manchester T.C. Application may soon be made to borrow £163,722 for erection of 106 maisonnettes and flats in Palmerston St, and £92,926 for 62 similar dwellings at New Cross.

Mynyddislwyn U.D.C. Erection of 22 houses and 6 bungalows at Ynysddu. Engineer and Surveyor, S. T. Monte, Council Offices, Pontllanfraith, Blackwood, Mon.

Nottingham T.C. Application may soon be made to borrow £41,295 for erection of Highbank infant school; £192,303 for Charnwood secondary school; and £174,425 for new grammar school at Bilborough.

Paisley T.C. Plans approved by Dean of Guild Court for 314 houses and 16 old person's houses.

Plymouth. Berker Sportscraft Ltd. are seeking site to build a new factory: existing premises at Honicknowle is said to be inconvenient. Chatsworthy Ltd. are also planning to erect premises, and architect is H. J. Hammick, 10 Princess Sq, Plymouth.

Shipton-on-Stour (War). Application may be made soon to borrow £120,000 for erection of county secondary school.

St. Pancras B.C. Layout plans prepared for erection of 214 flats in blocks ranging from 4 to 12 storeys in Regent Sq, (No.1) redevelopment scheme.

Stratford-on-Avon R.D.C. Tenders to be invited for wiring of 16 houses in Milcote Rd and in village of Weston.

Sunderland T.C. A £50,000 health centre to be built on Springwell estate. Quantity surveyors are Hall and Stafford, Sunniside Chambers, West Sunniside. Building programme for next year will include primary schools at Castle View and Farringdon and technical school at Moorlands. Also, £600 is to be spent on electrical work in pharmacy dept. of Technical College.

Tynemouth T.C. Parks and Sands Committee has approved in principle erection of ice-rink at Grand Parade. Scheme provides for 2-storey building, ice-rink, accommodation for 3,000, restaurant and shops. Architects are A. J. Seal and Partners, Majestic Chambers, Bournemouth, with C. S. Errington, 46 Grainger St, Newcastle-on-Tyne. Cost estimated at £300,000.

Watford. Improvements at Shrodells Hospital estimated to cost £25,000.

West Bromwich T.C. Plans in hand for 42 houses and 30 flats on Yew Tree estate.

Overseas

New Zealand. Representation of U.K. manufacturer of complete sealed units, motor compressors and refrigeration controls, sought by J. Russell Hancock Ltd., Representation Div., P.O. Box 414, Evening Post Building, Willis St, Wellington. All sizes normally produced for domestic refrigerators required, and demand would be between 4,000 and 4,500 units a year.

TRADE NOTES

New Branch. The John Thompson group of companies has opened a branch office in the North of England, operating from "Ravenswood," Westfield Lane, Ryton-on-Tyne, Co. Durham.

Representatives. Linealux Ltd. have appointed two further area representatives. They are: Mr H. W. Niven, 1 Terrace Place, Newcastle upon Tyne 2 (Telephone No.: Newcastle 26804), covering Northumberland, Cumberland, Westmorland, Durham, including Middlesbrough; and Mr S. A. Woods, Faulkners Electrical Supplies Ltd., 11 Albert Sq, Manchester 2 (Telephone No.: BLA 2459), covering Lancashire, Cheshire and North Wales.

Change of Name. The title of Rothermel Corporation Ltd. is to be changed to Motor and Electronics Corporation Ltd.

Beama Contract Price Adjustment Formulæ.—*For Electrical Machinery and Equipment.* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 24 July, 1954, shall be deemed to be 150s. 6d.; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry published in the Board of Trade Journal on 24 July, 1954, is 159·9.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 24 July, 1954, shall be deemed at 150s. 6d. (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on 24 July, 1954, are: Materials used in Mechanical Engineering Industries—150·8, "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—145·9. The price of brass condenser tubes, ¾ in. o/d 18 s.w.g. published in *The Metal Bulletin* on 23 July, 1954, is 3s. 6½d. per lb.

For outstanding Contracts covered by the B.O.T. Intermediate Products Index. For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 24 July, 1954, shall be deemed to be 150s. 6d.; (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on 24 July, is 360·6.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Mead and Phasey Ltd., 43a Brookhill Rd, Woolwich, S.E.18. Motor, mechanical, electrical and general engineers, etc. Nom. cap.: £1,000. Dirs.: D. W. Mead and W. G. Phasey.

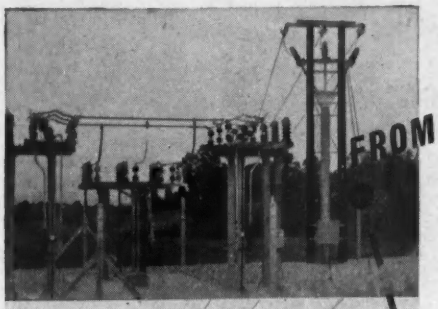
Thompson and Harris Ltd., 60a, Caroline St, Birmingham 3. Manfrs. of and dealers in household utensils, china, glass, household fittings, electrical appliances, etc. Nom. cap.: £500. Dirs.: R. P. Thompson and D. H. Harris.

Faulkners Electrical Supplies Ltd. Nom. cap.: £100. Dirs.: to be apptd. by subs. Subs.: T. M. Fryer, 1 Central St, Manchester, and G. Thompson, 2 Dacre Ave, Manchester.

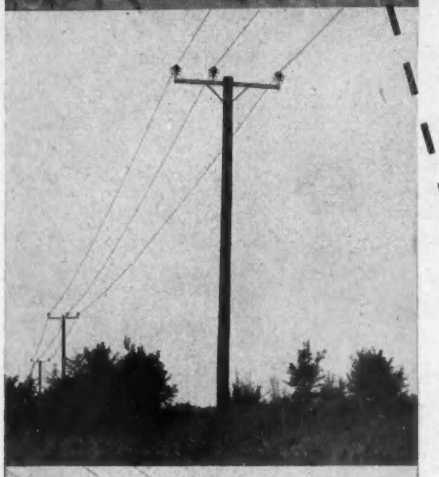
Spotnails Ltd., Devonshire Hse, Vicarage Cres, S.W.11. Electrical, mechanical and general engineers, manufacturers of and dealers in staples, pins, nails, etc. Nom. cap.: £50,000. Dirs.: to be appointed by subs. Subs.: G. E. Marbaix, 52 Parkside, Wimbledon, S.W.19; G. E. H. Marbaix, 68 Higher Drive, Banstead.

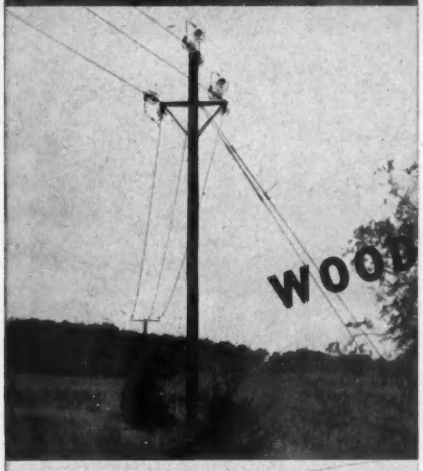
E. J. Goodall and Co. Ltd., 111 Chiltern Drive, Surbiton, Surrey. Manufacturers of and dealers in mechanical apparatus and accessories, and in particular wireless and television sets, etc. Nom. cap.: £1,000. Dirs.: E. J. Goodall and Mary Goodall.

English Salvi Co. Ltd., 94 Old Broad St, E.C.2. Merchants, agents, factors, brokers, exporters, manufacturers and sellers of electrical and associated goods and materials, including conductor accessories for high voltage transmission lines, etc. Nom. cap.: £100. Dirs.: S. L. R. Hollis and J. H. M. Sykes.

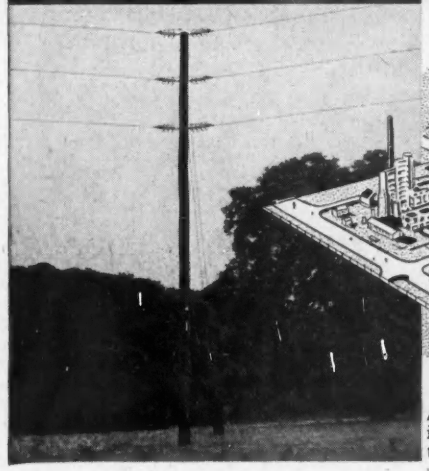


FROM SHORNE





WOOD



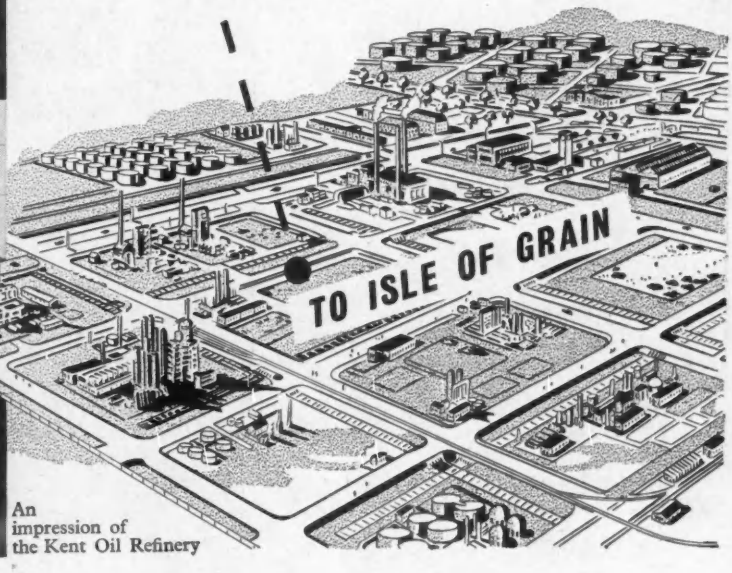
This 33kV single-circuit, wood pole overhead line was erected by HENLEY Contract Engineers for the South Eastern Electricity Board to supply the Anglo-Iranian Isle of Grain Refinery, Kent. The line, 13½ miles long, is fed from a substation on Watling Street, Shorne.

Generally the conductors are arranged in horizontal formation. They change to triangular formation at light angle poles and to vertical formation at heavy angle poles. To avoid changing from the horizontal directly to vertical and vice versa in a single span, an intermediate triangular formation is adopted.

For any problem concerning overhead lines, concrete, wood pole, and steel tower transmission lines for voltages up to 275kV — call in Henley's.

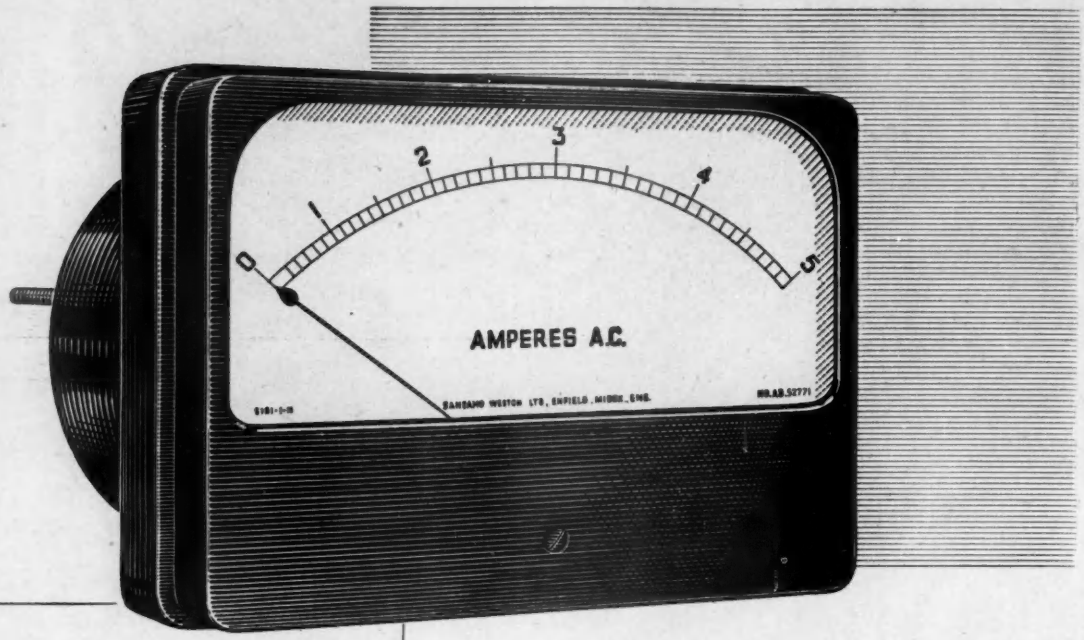
POLE LINES BY HENLEY

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.
51 - 53 HATTON GARDEN, LONDON E.C.1.



TO ISLE OF GRAIN

An impression of the Kent Oil Refinery



WESTON ELECTRICAL INSTRUMENTS INCLUDE:–

LABORATORY STANDARDS

SUB STANDARDS

FIRST GRADE PORTABLE INSTRUMENTS

ROUND, RECTANGULAR AND EDGEWISE SWITCHBOARD AND PANEL INSTRUMENTS

PORTABLE TEST SETS

RELAYS

AIRCRAFT INSTRUMENTS

THE WESTON RANGE OF RECTANGULAR INSTRUMENTS

These instruments, giving the advantage of long, easily read scales, are designed to harmonize with rectangular panels and are offered in a variety of types and scale ranges.

Supplied as D.C. moving coil, A.C. rectifier and H.F. thermocouple types; also A.C./D.C. moving iron types.

Four sizes are available with scale lengths of 2·5″, 3·2″, 4·2″ and 6·25″.

Front of panel or back of panel mounting may be adopted as desired and if the former method is used, there is complete interchangeability with existing round models.

The 3·2″ and 4·2″ scale instruments are available with either illuminated or non-illuminated dials; the 2·5″ and 6·25″ scale instruments being available only with non-illuminated dials.

WESTON

Measuring Instruments

SANGAMO WESTON LIMITED

ENFIELD · MIDDLESEX

Tel: Enfield 3434 (6 lines) & 1242 (6 lines) Grams: Sanwest, Enfield

Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 41151

Branches: London, CHAncery 4971 · Glasgow, Central 6208 · Manchester, Central 7904 · Newcastle-on-Tyne, Newcastle 26867 · Leeds, Leeds 30867 · Liverpool, Central 0230 · Wolverhampton, Wolverhampton 21912 Nottingham: Nottingham 42403 · Bristol, Bristol 21781 · Southampton Soton 2328 · Brighton Brighton 28497

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

CITY OF MANCHESTER
Housing Committee

TENDERS are invited for Electrical Installations on the following Contracts:
Contract 204—30 Houses and Cottage Flats, Plant Hill Rd, Blackley.
Contract 199 B and E—98 Residential Flats, Greenwood Rd, Wythenshawe.
Schedules and tender forms may be obtained on application to the Director of Housing, Town Hall, Manchester 2, on payment of a deposit of one guinea, returnable on receipt of a bona-fide tender. Tenders which must be sealed in an official envelope endorsed "Electrical Installations" must be received by the Town Clerk not later than noon on Thursday, 12 Aug., 1954.

PHILIP B. DINGLE,
Town Clerk.
(K 572)

COUNTY BOROUGH OF SWANSEA
Fforest Hall County Primary School, Swansea
TENDERS FOR ELECTRICAL INSTALLATION

FIRMS wishing to Tender for the Electrical Installation at Fforest Hall County Primary School to be erected at Fforest Hall, Swansea, are invited to submit their Applications to the Borough Architect, The Guildhall, Swansea, on or before Friday, 6 Aug., 1954.
Plans, Specifications and Conditions of Contract can be obtained on application and deposit of £2, provided the applicant gives satisfactory evidence of having previously carried out work of a similar character.
The deposit will be refunded after delivery of a bona fide Tender (which is not subsequently withdrawn) and the return of all documents.
No guarantee is given that the lowest or any other Tender will be accepted.

T. B. BOWEN,
Town Clerk.
The Guildhall,
Swansea,
14 July, 1954. (K 513)

BOROUGH OF NEATH
STREET LIGHTING, TRUNK ROAD, A.48

TENDERS are invited in connection with the provision of Group "A" Electric Lighting to approximately 3¼ miles of Trunk Road. The lighting will be mainly of the sodium type and tenders should be submitted on the following basis:
(*a*) Supply and delivery of all electrical equipment.
(*b*) Supply and erection of steel and concrete columns and fixing and wiring of electrical equipment offered in own tender;
(*c*) Supply and erection of steel and concrete columns and fixing and wiring of electrical equipment of another supplier.
Contract Documents can be obtained and plans viewed at the office of Mr D. Bailey, A.M.I.C.E., Borough Engineer, Gwyn Hall, Neath, on payment of a deposit of £2. 2s.

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which will be refunded on the submission of a bona-fide tender and the return of all Contract Documents.
Tenders must be sent to the undersigned not later than 20 Aug., 1954, in a sealed envelope endorsed Trunk Road Street Lighting, and bearing no mark which will identify the sender.
The Council reserves the right not to accept the lowest or any tender.

A. E. I. CURTIS,
Town Clerk.
Town Clerk's Office,
Town Hall, Neath.
July, 1954. (K 573)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, *or a woman aged* 18-59; *unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order,* 1952.

SOUTHERN ELECTRICITY BOARD
DEMONSTRATORS

BOURNEMOUTH District and Lyndhurst District of No. 4 (Bournemouth) Sub-Area. N.J.C. Grade 1 (£400/£490 per annum), N.J.C. Conditions of Service.
Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, and to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.
The successful applicants will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.
Application on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him not later than 13 Aug., 1954. (K 548)

TECHNICAL INSTRUCTOR
Electrical

required by NIGERIA for two tours of 15-24 months or three tours of 10-12 months with option of appointment either (*a*) on agreement with prospect of permanent and pensionable employment in salary scale (including expatriation pay) £750 rising to £1,175 a year or (*b*) on temporary contract in salary scale (including expatriation pay) £807 rising to £1,269 a year with a gratuity at rate of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They should possess recognised technological qualifications and have had experience in apprentice training. Write to the Crown Agents, 4 Millbank, London. S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/29963/EE (K 538)

BRITISH ELECTRICITY AUTHORITY
South Western Division

(*a*) SECOND ASSISTANT ENGINEER (Civil)—Generation Construction Department, Bristol. N.J.B. 2AX/CX £834/£1,025.
(*b*) ASSISTANT SHIFT CHARGE ENGINEER—East Yelland Generating Station. N.J.B. O9, £641/£667.
Superannuation.
Candidates for (*a*) should preferably be Corporate Members of the Institution of Civil Engineers, be experienced in the design and construction of heavy foundations and building works associated with modern Power Stations; also in the preparation of preliminary Schemes and Estimates, Specifications, Bills of Quantities, in writing Reports, and general control of Building and Civil Engineering Contracts.
For (*b*) should have a sound technical training and practical operating experience in a modern generating station.
Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by (*a*) 28 Aug. and (*b*) 7 Aug., 1954. (K 558)

THE NORTH WESTERN ELECTRICITY BOARD
APPOINTMENT OF DISTRICT COMMERCIAL ENGINEER,
SOUTH DISTRICT, CHEADLE

DUTIES will include the organisation and control of all commercial staff and functions of the District; supply of information and advice to all classes of consumers on electricity utilisation, tariffs and all matters concerning electricity services; organisation and supervision of contract wiring work and maintenance services on consumers' premises; control of Service Centres, demonstrations, exhibitions, etc.; organisation and supervision of consumer records.
Salary Scale: £1,002/£1,046 p.a., Grade F.2, N.J.B. Conditions.

APPOINTMENT OF GENERAL ASSISTANT ENGINEER (ASSISTANT CHARGE ENGINEER) SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

Applicants should be competent to carry out switching duties on a large E.H.V. and L.V. transmission and distribution system, including the use of supervisory switching, in accordance with instructions received from the Sub-Area Control Charge Engineer. Some experience in switchgear and transformer maintenance will be considered an advantage. The duties will be on a shift basis. Applicants should possess the H.N.C. in Electrical Engineering, or an equivalent qualification.
Salary Scale: £692/£716 p.a., Grade N.13, N.J.B. Conditions.
Applications to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester. P.O. Box 493, by 7 Aug., 1954. (K 545)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:
(*a*) TWO ASSISTANT SECTION ENGINEERS, Warrington District;
(*b*) ASSISTANT SECTION ENGINEER (OPERATION), Wrexham District;
Salaries £607/£629 p.a. (N.J.B. Class F, Grade 9). Appointments superannuable and subject to medical examination.
Applicants should have experience with H.T. and L.T. overhead and underground distribution work, and preferably have the technical qualifications to enable them to become Chartered Electrical Engineers.
For posts (*a*) application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, near Northwich, Cheshire. For post (*b*) application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham.
Closing date: 9 Aug., 1954. (K 539)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (*a*) and Corporate Membership for posts (*b*) an advantage.

(*a*) ASSISTANT ENGINEER (INSTRUMENTS)—BANKSIDE GENERATING STATION
Vacancy No. 54/604

Applicants to be capable of maintaining calibrating and testing instruments relating to steam and water flows, pressure and temperature indicators, similar to those used in boiler and turbine plant and should have received a sound technical training. Salary —Class H, Grade 12=£593. 5s. p.a.

(*b*) DEPUTY STATION SUPERINTENDENT—BLACKWALL POINT GEN. STN.
Vacancy No. 54/605

Candidates should have received a sound technical training in Mechanical and Electrical Engineering followed by practical experience in the operation, maintenance and administration of a modern Generating Station, coupled with a successful record in the promotion of good labour relations. Salary—Class F, Grade 3= £957. 12s. p.a.

(*b*) MAINTENANCE ENGINEER (MECHANICAL) —BRUNSWICK WHARF GEN. STN.
Vacancy No. 54/606

Wide experience necessary in maintenance of modern generating plant. Duties will include co-ordination of maintenance work and programmes covering the mechanical maintenance of the boiler house, turbine house, coal handling plant, etc. Salary—Class K, Grade 7=£912. 9s. p.a. Applications received in reply to previous advertisements will be considered.

(*b*) SHIFT CHARGE ENGINEER—FULHAM GENERATING STATION
Vacancy No. 54/607

Considerable experience in the operation of a large modern Power Station necessary. Character and ability to deal with Staff problems important. Salary—Class L, Grade 7=£972. 6s. p.a.

(*a*) GENERAL ASSISTANT ENGINEER—TECHNICAL DEPARTMENT, DIV. H.Q.
Vacancy No.54/608

Experience in manufacture and testing of electrical equipment used in Generating Stations and on high voltage transmission systems. The successful candidate may be required to work on the power section, metering section or development section and experience suitable for any of these fields will be considered an advantage, such as commissioning and maintenance of large electrical plant including protective gear, maintenance and calibration of polyphase meters and allied equipment and calculation of fault currents and load flows in complex A.C. networks. Salary—Class AX/EX, Grade 8=£526. 1s./£670. 19s. rising to £749. 14s. p.a.

(*a*) THIRD ASSISTANT ENGINEER—SYSTEM OPERATION DEPARTMENT THAMES GRID CONTROL AREA
Vacancy No. 54/609

Duties (Day or Shift) are of a general engineering nature. Applicants should have had a good general and technical education and have passed I.E.E. examination or equivalent. Steam Generating Station experience an advantage. Salary—Class AX, Grade 5=£681. 9s./£829. 10s. to Grade 5, Class EX, £909. 6s./£927. 3s. p.a.

(*a*) JUNIOR ENGINEERS
Vacancy No. 54/560

Junior Engineers required at various power stations in the London Area. Excellent opportunities for training and promotion to higher grades. Salary and conditions of service in accordance with N.J.B. Agreement.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, British Electricity Authority, London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (K 557)

SOUTH EASTERN ELECTRICITY BOARD
FIRST ASSISTANT DISTRICT ENGINEER
(Crawley District)

SALARY £675/£701 per annum under N.J.B. Class C, Grade 5. Superannuable. Applicants should be qualified and have experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV. Duties will involve standby.

Applications naming 2 referees to F. A. Avery, A.I.E.E., District Manager, SEEBoard, 55 High St, Crawley, Sussex, by 11 Aug., 1954.

A. L. BURNELL,
Secretary.
(K 566)

POWER STATION ELECTRICAL AND MECHANICAL ENGINEER

required for service with the SUDAN LIGHT AND POWER CO., LTD., in Khartoum, Sudan, as Deputy Power Station Superintendent. Basic salary on appointment within the range £E.1,500/£E.2,000 per annum according to qualifications and experience (£E.1=£1. 0s. 6d.). Candidates should be between the age of 30 and 45 years, and have had not less than 10 years experience in the construction and operation of modern power stations equipped with boilers and turbine alternator sets operating at not less than 400 p.s.i.g. and 750° F, and E.H.T. switchgear and associated control equipment. Experience with oil fired boilers, and also diesel alternators up to 1,200 kW of value. Evidence should be produced of having held positions of responsibility requiring organising and administrative ability. Initially duties will include the supervision of erection and commissioning of a steam power station equipped with two 5 MW steam turbine alternator sets.

Appointment will be on contract by arrangement up to 10 years, including a period of 12 months probation, with a bonus payable on completion of the contractual period. Free living accommodation with basic furniture or an allowance in lieu thereof will be provided. After satisfactory completion of the probationary period liberal leave on full salary with free passages. In addition to basic salary a cost of living allowance will be payable; and a kit allowance of £E.50 on appointment.

Applications stating age, education, qualifications, experience (with particulars of posts held), present appointment and salary with names of two references should be submitted to the Secretary, The Power and Traction Finance Company Limited, Queens House, Kingsway, London, W.C.2. (K 454)

EAST MIDLANDS GAS BOARD
Sheffield and Rotherham Division
DIVISIONAL ELECTRICAL ENGINEER

APPLICATIONS are invited for the position of Electrical Engineer to the Sheffield and Rotherham Division of the Board.

Candidates must be Corporate Members of the Institution of Electrical Engineers and should be familiar with the installation, operation, maintenance and inspection of A.C. generating plant, main switchgear, motors, manual and automatic control gear and armoured cables. A knowledge of high tension switchgear and mercury arc rectifiers would be considered an advantage. The successful candidate would be responsible to the Divisional Engineer.

The commencing salary would be not less than £900 per annum and the successful applicant may be required to pass a medical examination. Also, unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, he would be required, if eligible, to join the Board's Staff Pension Scheme within six months from taking up the appointment.

Applications, with the names and addresses of two referees, should be forwarded to the undersigned to reach him not later than the 31 Aug., 1954.

C. C. WOOD,
Divisional General Manager.
Commercial Street,
Sheffield. (K 537)

THE SOUTH WEST SCOTLAND ELECTRICITY BOARD
Dumfries and Galloway Sub-Area
SENIOR ASSISTANT ENGINEER
(CONSTRUCTION)
AT SUB-AREA HEADQUARTERS

APPLICANTS should have a wide practical experience in the design, planning, lay-out and erection of 33 kV, 11 kV, and low voltage overhead and underground mains and substations. Possession of a technical qualification will be an advantage.

The person appointed will be responsible for constructional and civil engineering work in a large area, predominantly rural. The post is superannuable and the salary will be in accordance with the N.J.B. Agreement, Class "G," Grade 4, £905/£944 per annum.

Applications, stating age, qualifications and experience, together with the names of two referees, should be forwarded to the undersigned not later than 18 Aug., 1954.

W. H. WILLS,
Manager.
Marchmount,
Dumfries.
21 July, 1954. (K 549)

THE SOUTH WALES ELECTRICITY BOARD

REQUIRED COMMERCIAL ASSISTANT, District 342 (Merthyr) in the Central Sub-Area.

Applicants must have had experience in the application of electricity to commercial and domestic premises and all general purposes.

Salary—Class E, Grade 13 (£447/£453/£460) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7 Aug., 1954.

D. G. DODDS,
Secretary.
St. Mellons,
Cardiff. (K 567)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SHIFT CONTROL ENGINEER
WARWICK POWER STATION
Vacancy No. 107/54/ET

Applicants should have had some experience in Power Station Control and have O.N.C. in Electricity.

Salary for this appointment will be within Class E, Grade 10 (£555/£569 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 5 Aug., 1954.

JUNIOR ENGINEERS
STAYTHORPE POWER STATION
Vacancy No. 108/54/ET

Junior Engineers are required at Staythorpe Power Station, where suitable young Engineers will be given opportunity to obtain operating and maintenance experience in the various sections of this large Generating Station operating at 900°/900 lb sq in. steam conditions.

Salary for this appointment will be within Class J, between Grades 17 and 14 (£424/£545 per annum) of the National Joint Board Agreement, according to qualifications and experience.

Preference will be given to candidates who hold the Higher National Certificate, or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Closing date for receipt of applications, 5 Aug., 1954.

These appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.
(K 565)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Chilterns Sub-Area:

Sub-Area Headquarters, Bedford

100/54.N
THIRD ASSISTANT ENGINEER (COMMERCIAL)

Candidates should have had a good general and technical education with experience in industrial and commercial power sales development. A competent knowledge of tariffs, thermal storage, space heating and street lighting is essential. Membership of the Institution of Electrical Engineers will be an advantage.

Salary in accordance with Class L, Grade 10 of the National Joint Board Salary Agreement, commencing at £766.

Apply to the Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend St, Bedford.

Hemel Hempstead District

86/54.R
THIRD ASSISTANT ENGINEER

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. underground and overhead systems.

Salary in accordance with Class E, Grade 9 of the National Joint Board Salary Agreement commencing at £587.

Apply to the District Manager, Hemel Hempstead, Eastern Electricity Board, 44 Marlowes, Hemel Hempstead, Herts.

Future salaries and conditions of service for both these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within fourteen days of the appearance of this advertisement. (K 553)

BRACKNELL DEVELOPMENT CORPORATION

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER (Electrical Services) on the staff of the Chief Engineer at a salary of £660 x £40—£860 per annum.

Candidates should be Associate Members of the Institution of Electrical Engineers and should have had good experience in the design and execution of electrical installations. The successful candidate will be required to advise on and prepare schemes for electrical installations in houses, factories, shops, etc., street lighting installations and electrical services, including high tension supplies, in connection with the construction of a new sewage treatment works.

Superannuation schemes. Medical examination. Housing available in due course. Applications giving age, education, experience, qualifications and appointments held (with dates and salaries) together with two referees, should be sent to the General Manager, (AE) Bracknell Development Corporation, Farely Hall, Bracknell, Berks, not later than Saturday, 14 Aug., 1954. (K 563)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

JUNIOR ENGINEER is required in the Metering Section of the Technical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule C, Grade 9, commencing in range £390/£525, ultimately rising to £572 per annum.

Applicants should have had metering experience, particularly in the calibration of electrical indicating instruments, and should preferably possess Ordinary National Certificate.

Apply, quoting Vacancy No. 719MD on form AE6, available from Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 14 Aug., 1954. (K 547)

BRITISH ELECTRICITY AUTHORITY
South Eastern Division

APPLICATIONS are invited for the position of THIRD ASSISTANT ENGINEER (Operation) at Divisional Headquarters, Kingston. Applicants should have a good electrical and mechanical engineering background, together with a sound knowledge of operation of modern power station plant. The successful applicant, who must have ambition and the ability to work effectively as a member of a team, will be engaged on work that requires an active analytical and enquiring mind. Membership of either the Institution of Mechanical or Electrical Engineers will be an advantage. Class AX, Grade 5, commencing at £681. 9s. p.a. including London allowance. Applications giving details of education, present position, experience, etc., should be received by the Establishments Officer, British Electricity House, Lower Ham Rd, Kingston-upon-Thames, by 13 Aug., 1954. (K 577)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

THE following amends the Advertisement previously issued for Vacancies Nos. 1/54. 2/54. 3/54.

TWO—SENIOR DRAUGHTSMEN (CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 112/54/ET

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:

Reinforced concrete structures.

Piled and slab foundations for heavy components.

Cable subways, Bridges and Culverts.

The salary will be in accordance with Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications 12 Aug., 1954.

TWO—SENIOR DRAUGHTSMEN (MECHANICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 113/54/ET

Candidates should have experience on one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

The salary will be in accordance with the National Joint Board Agreement Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D according to experience.

Closing date for receipt of applications 12 Aug., 1954.

FOUR—SENIOR DRAUGHTSMEN (ELECTRICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 114/54/ET

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement, Grade 4 (£671/£780 per annum) or Grade 5 (£567/£671 per annum) of Schedule D according to experience.

Closing date for receipt of applications 12 Aug., 1954.

The above appointments will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy No.

L. F. JEFFREY,
Divisional Controller.

23 July, 1954. (K 564)

YORKSHIRE ELECTRICITY BOARD
No. 3 (Sheffield) Sub-Area

Rotherham/Mexborough District
ASSISTANT CONSUMERS' ENGINEER

APPLICANTS should be Corporate Members of the Institution of Electrical Engineers or hold qualifications leading to such membership, and must have had a sound training with subsequent experience in the work of a Consumers' Department in an Electricity Undertaking. Some experience of statistical work would be an advantage.

Details should be given of experience in the following matters:

Negotiations with consumers requiring electricity supplies, tariffs, sales development, application of I.E.E. Wiring Regulations and other relevant regulations in testing and inspecting consumers' installations, electrical installation work, including preparation of specifications and tenders, electrical maintenance workshop, control of staff and workpeople.

Salary—N.J.B. Class J, Grade 10, £680/£706 per annum.

Sheffield North and South Districts
ASSISTANT INSTALLATION ENGINEERS
(Two Posts)

Applicants should possess a sound technical training and preferably be graduate members of the Institution of Electrical Engineers or possess similar qualifications.

The duties of the post include negotiations with consumers for new and additional supplies of electricity, advice on tariffs and utilisation including Power Factor correction, specifications, estimates and tenders for all classes of installation work, supervision of installations on site and control of staff and workpeople.

Salary—N.J.B. Class L, Grade 12, £667/£692 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 12 Aug., 1954. (K 570)

BRITISH ELECTRICITY AUTHORITY
South East Scotland Division

GENERAL ASSISTANT ENGINEER required in the "Protective Gear and General Section" of the Technical Department at Divisional Headquarters, Portobello.

Applicants should possess qualifications leading to Associate Membership of the I.E.E. and have experience in the design, manufacture and commissioning of switchgear and protective gear. Knowledge of Transformers and Alternators an advantage.

Salary scale £501/£656 per annum. (N.J.B. Class AX/BX/8). Placing according to experience. Pension Scheme.

Apply in writing by 7 Aug., 1954, to Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, Portobello, Midlothian. (K 571)

BLACKBURN EDUCATION COMMITTEE
Municipal Technical College and School of Art
ENGINEERING DEPARTMENT

APPLICATIONS are invited for the post of Full-Time ASSISTANT LECTURER (Grade "A") in the Electrical Engineering Section of the Engineering Department.

Candidates should be capable of teaching Electrical Installation subjects to Course "B" and "C" Certificate standard of the City and Guilds and also Electrical Engineering subjects to at least O.N.C. standard.

A degree in Engineering or equivalent qualification is desirable, together with teaching and industrial experience.

Salary in accordance with Burnham Technical Scale for Grade "A" Assistants, i.e. £415 by £18—£670 plus appropriate allowances.

Application forms may be obtained from the Chief Education Officer, Education Offices, Blackburn, and should be returned to him within a fortnight of the appearance of this advertisement. (K 546)

A CAREER AS A REGULAR ARMY OFFICER FOR QUALIFIED ENGINEERS

MECHANICAL, ELECTRICAL AND ELECTRONIC ENGINEERS are required as officers in the Corps of Royal Electrical and Mechanical Engineers.

There are two methods of entry. These are either:

(1) On a short service commission (which offers a good opportunity of obtaining a permanent commission) with a gratuity of about £100 for each completed year of service on leaving, or

(2) On a Permanent Regular Commission with a valuable pension and a terminal grant of £1,000 (tax free).

Candidates must be physically fit and not yet 29 years old, and have passed or be exempt from examinations of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers as required for graduates, or have a University degree in Natural Science or Engineering. In addition 2½ years' experience as an engineer (or 1½ years in the case of University graduates) is normally required.

The pay which Army officers may expect is according to the following table:

Rank	*Normal Age*	*If Single*	*If Married*
Lieutenant	23	£686	£831
Lieutenant	25	£723	£860
Captain	27	£860	£997
Major	34	£1,188	£1,325
Lt.-Colonel	42	£1,453	£1,581
Colonel	45	£1,791	£1,919
Brigadier	49	£2,065	£2,184

(Note.—This is the U.K. scale; there are various additions in certain overseas stations. In this table the figures of a single officer's pay include an element for food and accommodation which are normally provided in kind. This has been done to provide a direct means of comparison with civilian scales of pay.)

For further details please write to: The War Office (AG1 (Officers) C), London, S.W.1, and quote this publication. (K 450)

THE SOUTH WALES ELECTRICITY BOARD

REQUIRED ASSISTANT ENGINEER (Mains) in District 462 (Newport) in the Eastern Sub-Area.

Salary—Class F, Grade 10 (£577/£588/£598) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7 Aug., 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (K 568)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following posts:

JUNIOR ENGINEER—NORWICH GENERATING STATION

Salary Class F/15 £402, Class F/14 £466 per annum.

The duties of the successful applicant will include assisting in the Control Room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a Generating Station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

SHIFT CHARGE ENGINEER—LETCHWORTH L.2 GENERATING STATION

Salary Class D, Grade 7, £633/£643 per annum.

SHIFT CHARGE ENGINEER—COLCHESTER GENERATING STATION

Salary Class B, Grade 7, £559/£586 per annum.

Applicants should preferably have served an apprenticeship and have reached the standard of Ordinary National Certificate in Electrical and/or Mechanical Engineering and possess experience in the operation of Generating Stations.

Applications stating age, qualifications and

continued in next column

continued from previous column

experience should be sent to the Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by 7 Aug., 1954.

W. N. C. CLINCH,
Controller. (K 555)

THE SOUTH WALES ELECTRICITY BOARD

REQUIRED TWO ENGINEERING DRAUGHTSMEN in the Central Sub-Area at Cardiff.

Salary—Grade 6, Class D (£433/£567) of N.J.B. Schedule.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 7 Aug., 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. (K 569)

BRITISH ELECTRICITY AUTHORITY
North West, Merseyside and N. Wales Division

VACANCY No. 129/54—SHIFT CHARGE ENGINEER, Stuart St Generating Station, Manchester. Salary £772/£802 (H.7).

Vacancy No. 132/54—STATION SHIFT CONTROL ENGINEER, Burnley Generating Station. Salary £502/£521 (C.10).

Apply, quoting vacancy No. to Controller, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 7 Aug. (K 556)

TRANSFORMER DESIGNERS

BRUCE PEEBLES AND CO., LTD., Engineers, Edinburgh, 5, invite applications for the following positions:

CHIEF DESIGNER in charge of the Transformer Design Department and fully responsible for design of Transformers of all sizes up to 150 MVA at voltages up to 275 kV.

This is an important and attractive position with full scope for initiative.

A commensurate salary will be paid to a man of proved ability.

ASSISTANT DESIGNER experienced in design of distribution and medium size power transformers. Salary commensurate with experience.

Applications with full details to Mr R. W. Flux, Manager, Transformer Department, at above address. (K 576)

ALKALINE BATTERIES LTD., of Redditch, are the largest makers in the Empire of Alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its Technical Sales and Development Sections for Graduate ELECTRICAL ENGINEERS, not over 30 years of age, or for men nearing the end of their Degree Course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed to Commercial Manager, Alkaline Batteries Ltd., Union St, Redditch. (K 23)

BOTH METER AND RELAY TESTERS for Development Work are required by The English Electric Company Ltd., at Stafford. This is not routine work and technical knowledge is necessary to a minimum of O.N.C. Applicants with suitable experience and qualifications should write quoting Ref. 1175D to Dept. C.P.S., 336/7 Strand, W.C.2. (K 543)

ELECTRICAL ENGINEER wanted (aged 30-40, preferably Chartered) to assume leading position—commanding equivalent £1,000 p.a. to start—in Design Office of London Company manufacturing automatic precision machinery. Previous drawing office and industrial experience of control gear and mechanisms essential. Apply—Box No. 3683, Electrical Times. (K 485p)

M.T.E. CONTROL GEAR LTD.
require fully experienced
PRODUCTION MANAGER
Must be completely conversant with Machine Shop and Control Gear Assembly Practice. Immediate managerial status and excellent future opportunities. Apply giving full details of previous experience to:
M.T.E. Control Gear Ltd.
London Road
Leigh-on-Sea, Essex (K 582p)

BRITISH OVERSEAS AIRWAYS CORPORATION require for their new Headquarters Building at London Airport the following:

1. ELECTRICAL WORKS FOREMAN, salary scale £12. 6s. to £13. 16s. a week.
2. FOUR ASSISTANT ELECTRICAL WORKS FOREMEN £11. 7s. 6d. to £12. 2s. 6d. a week.

Foreman must have wide practical experience of operation and maintenance of electrical services including heavy switchgear, motors, 11 kV distribution, and control of staff. H.N.C. or O.N.C. in electrical engineering and training in maintenance of cranes, lifts and automatic control mechanisms.

Assistant Foremen should have wide practical experience of electric lighting and power services in large industrial buildings and control of electricians. O.N.C. in electrical engineering and knowledge of cranes, lifts, etc.

Apply Staff Manager, H.O., Airways House, Gt. West Rd, Brentford, Middx., stating age, qualifications and details of past experience and posts held. (K 559)

DRAUGHTSMAN for Lighting Fittings Design. Some experience of estimating an advantage. Reply in confidence giving fullest details of training and experience, stating age and salary required to R. and A. G. Crossland Ltd., Cartbridge Lane, Walsall. (K 493)

ELECTRICAL DRAUGHTSMAN required by Glasgow firm of Engineers for new development project. Five-day week, canteen and superannuation scheme in operation. Written applications desired in the first instance outlining technical education (which should be to at least O.N.C. standard), previous drawing office experience and salary required. Write to 1074, Wm. Porteous and Co., Glasgow. (K 540)

ELECTRICAL DRAUGHTSMEN. Two senior. Higher National Certificate standard. Apply to Chief Engineer, The Bowater Paper Corporation Ltd., Northfleet, Kent. (K 574)

ELECTRICAL FITTER required. Applicants should have outside erection experience on H.V. switchgear and transformers. Wages at present 3s. 9d. per hour, N.J.I.C. conditions. Apply, in writing, to Mr H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 31 Kingsway, Stoke-on-Trent. (K 578)

ELECTRICAL FITTERS required as permanent outworkers for erection of all types of power station and industrial installations. Comprising switchgear, transformers, rectifiers, large electrical machines and turbo-alternators. Apply Construction Dept., The British Thomson-Houston Co., Ltd., Rugby. (K 551)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

ARE YOU AN ELECTRICIAN?

If you are now or have knowledge and previous experience of electrical work you can get

IMMEDIATE EMPLOYMENT

in light engineering work of national importance. These jobs are available in the

SOUTH WEST LONDON AREA

They provide high earning possibilities for the right men and must be filled quickly. It is essential that applicants give fullest details including age, nature and extent of experience. Write to The Employer—Box No. 3705, Electrical Times. (K 554p)

ELECTRO MECHANICAL ENGINEER with sound theoretical and practical knowledge of drives for heavy machinery covering A.C. and D.C. motors, control gear, rectifying equipment, cabling and switchgear, required by Messrs Barron and Crowther Ltd., of Eastleigh, Hampshire, makers of wire drawing equipment. Write stating age, experience and salary required. (K 542)

ESTIMATING (SALES) CLERK (male) aged 21/30 required. Good standard in maths and general education essential. Progressive, superannuation, sports. Permanency for right man. Apply Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock. (K 560)

FERRANTI LTD. invite applications for the following vacancies in their Power Transformer Department:

(1) ENGINEERS for Design and Development work in Large Transformers, Voltage Regulators and Specialised High Voltage equipment. Qualifications include a degree or H.N.C. in electrical engineering and previous design or development experience in power engineering. Ref. TE.

(2) DRAUGHTSMEN (Electrical or Mechanical) with previous experience in power engineering. Ref. TD.

Applications are also invited from young graduates completing National Service either for direct employment or for practical works training. Ref. TG.

Vacancies also exist for graduate-apprentices wishing to undertake a planned two-year course of training for design, research and development, production or sales, prior to National Service. Ref. PGA.

The Company operates a Staff Pension Scheme. Application forms from Mr T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote appropriate reference. (K 575)

ELECTRICAL RESEARCH AND TESTING ENGINEERS

A. REYROLLE AND CO. have a number of vacancies for engineers to be engaged on ELECTRICAL RESEARCH and LABORATORY TESTING in connection with switchgear, protective gear, insulation, etc. For certain of the vacancies an Honours or Pass Degree is required; for the others a Higher National Certificate is adequate. The work will be varied and interesting and there will be good scope for advancement. Starting salaries in accordance with age, technical qualifications and experience. Apply with full particulars to the Chief Engineer, A. Reyrolle and Co., Ltd., Hebburn, Co. Durham. (K 475p)

ILLUMINATING ENGINEER with several years' practical experience required, preference given to applicants with Higher National Certificate in Electrical Engineering. Apply Chief Illuminating Engineer, Metropolitan-Vickers Electrical Co., Ltd., 1/3 St. Paul's Churchyard, E.C.4. (K 541)

INDUSTRIAL Lighting Fittings Manufacturers Midland area, require a man with DRAWING OFFICE experience, able to handle enquiries, estimating, etc., in preparation for manufacture. Good prospects. Give particulars of experience and salary required.—Box No. 3689, Electrical Times. (K 494)

JUNIOR DRAUGHTSMEN required by manufacturers of medium voltage switchgear. 5-day week and superannuation scheme. State age, technical qualifications, and salary required to Ottermill Switchgear Ltd., Ottery St. Mary, Devon. (K 501)

JUNIOR TECHNICAL ASSISTANT required for Sales Section of West London Electrical Instrument Manufacturers. Higher National Certificate standard essential. Write giving details of age, experience, qualifications and salary required.—Box No. 3707, Electrical Times. (K 562)

MAINTENANCE ELECTRICIANS required for Steel Works Plant in Cardiff. Knowledge of automatic control gear for A.C. and D.C. motors essential. Must be members of E.T.U. Day work on 44-hour week but prepared to work shifts on 48-hour week.—Box No. 3693, Electrical Times. (K 509)

MAJOR Oil Company requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London. Age 25 to 30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualification. Good practical experience required followed by 3 to 5 years in the drawing office on electrical installations for Process Plants, Workshops and Factories. He will have opportunities of visiting refineries for periods of temporary duty. Opportunities for promotion to engineering appointments occur within the Company and with its Associates both in the U.K. and overseas. Write giving full details and quoting H.2067 to Box 6815, c/o 191 Gresham House, E.C.2. (K 550)

MAJOR Oil Company requires one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in the Middle East. Age 25-30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualifications. An engineering apprenticeship is required which includes 3 years' practical experience in the shops followed by 3-5 years in the Drawing Office on electrical installations for Process Plants, Workshops and/or Factories. Overseas allowance in local currency, free passages out and home, free medical attention, kit allowance, good leave arrangements. Pension Scheme. Write, stating age and full details of qualifications, quoting F.500 to Box 1168, c/o 191 Gresham House, E.C.2. (K 561)

MANAGER for Electrical Installation Department. Must be capable of designing, estimating and supervising all types of installation. Please give details of experience and salary required, Simpson Brothers (of Hapton) Ltd., Hapton, Burnley. (K 579)

POWER STATION ATTENDANT required for heavy Industrial Plant in Cardiff. Applicants should have maintenance experience on large electrical machines and preferably a knowledge of H.T. Distribution Systems. Must be members of E.T.U. Day work on 44-hour week but prepared to work shifts on 48-hour week.—Box No. 3695, Electrical Times. (K 510)

JOHNSON & PHILLIPS LIMITED

STAFF FOR SOUTH AFRICA

Johnson and Phillips Limited require the following Staff for their South African Branch:

1. CHIEF DRAUGHTSMAN.
   Candidates must have good technical and practical qualifications, in addition to experience with leading switchgear manufacturers both in design and contract work.
2. SENIOR SWITCHGEAR DRAUGHTSMAN.
   Candidates must have good technical and practical training, in addition to experience with leading switchgear manufacturers. Some experience in switchgear design is essential.
3. TECHNICAL SALES ENGINEER.
   Candidates should have a technical background, preferably not less than Higher National Certificate level, and experience in preparing tenders for switchgear up to 33,000 V.
4. TECHNICAL SALES PROMOTION ENGINEER.
   Candidates should have a sound technical background, a pleasing personality and experience of outside representation among buyers and consultants. Successful candidate will operate from Johannesburg but may be expected to travel in the Northern part of the Union of South Africa, although most of his contacts will be in and around Johannesburg.

These appointments are for permanent situations at the J. and P. Switchgear Works at Driehoek, Johannesburg, where switchgear up to 11,000 V is manufactured, and enquiries for gear up to 66,000 V are handled. In all cases preference will be given to men between 28 and 38 years of age. Salaries will be in accordance with qualifications and experience and good bonus and life assurance schemes are in force. Applicants should clearly state for which post they are applying and state age, experience and salary required. Applications should be addressed to the Employment and Welfare Manager, Johnson and Phillips Limited, Charlton, London, S.E.7. (K 508p)

PIRELLI-GENERAL CABLE WORKS LTD. have SALES DEPARTMENT Staff vacancies for General Correspondence and preparation of Mains Cable Tenders. Apply in writing to Paper Cable Sales Department, Leigh Rd, Eastleigh, Hants. (K 530)

TRANSFORMER ERECTORS AND BENCH ELECTRICAL FITTERS Wanted, used to first class repairs work. Apply, Dowding and Mills Ltd., 24-26 White Post Lane, Hackney, London, E.9. (K 529)

APPOINTMENTS WANTED

AUSTRALIAN ELECTRICAL SALES REPRESENTATIVE, now in U.K., seeks agencies English manufacturers industrial switch, fusegear, electrical accessories, domestic appliances, etc. Contacts manufacturers, wholesalers, retailers. F. T. Welsh, 52 Chatsworth Rd, Morecambe, Lancashire. (K 444)

WANTED

ALL CABLES and Flexes bought. B.D.C., 591 Green Lanes, London, N.8. (K 345)

WANTED, D.C. and A.C. ball-bearing MOTORS, motor generator sets, dynamos and alternators.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London, N.1. (K 3)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (K 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (K 1)

WANTED, HOOVER HOTPOINT, etc. vacuums suitable reconditioning, also washing machines.—Box No. 3699, Electrical Times. (K 532)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (K 10)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (K 15)

ELECTRIC CLOCKS repaired. Quick service. 12 months' guarantee. J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel. HOP 2759). (K 488)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Tel.: Victoria 0197. (K 18)

METALWORK. All types cabinets, chassis, racks, etc., to your own specification. Philpott's Metalworks Ltd., Chapman St, Loughborough. (K 544)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (K 13)

FOR SALE

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—Chi. 5105, 67 Rothschild Rd, W.4. (K 5)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (K 6)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (K 2)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel: Forest Hill 7089. (K 14)

DIESEL GENERATING SET, 169 kVA, 400 V, 3-phase, 50 cycles. Full details on request to—The British Electric Transformer Co., Ltd., Hayes, Middlesex. (K 580)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (K 16)

FLUORESCENT BALLASTS—wide range —20 W, 30 W, 40 W, 80 W. Normal and high power factor. Built for long and dependable life—Optimum Performance—Quiet operation. Fully impregnated—Progressive compounding—Heavy encased housing—Quick deliveries. Data on request. Micramatic Ltd., Bournemouth, Hants. (K 20)

FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Rd, London, N.W.9

Tel.: COLindale 4621/3,

Grams: Lectropowa, Hyde, London (K9p)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (K 7)

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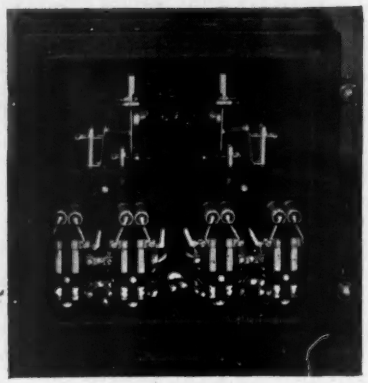

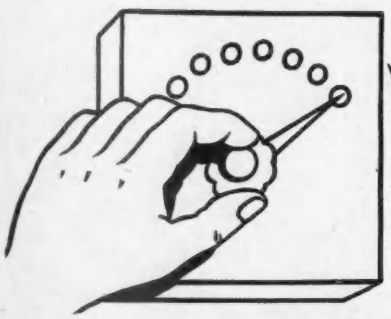

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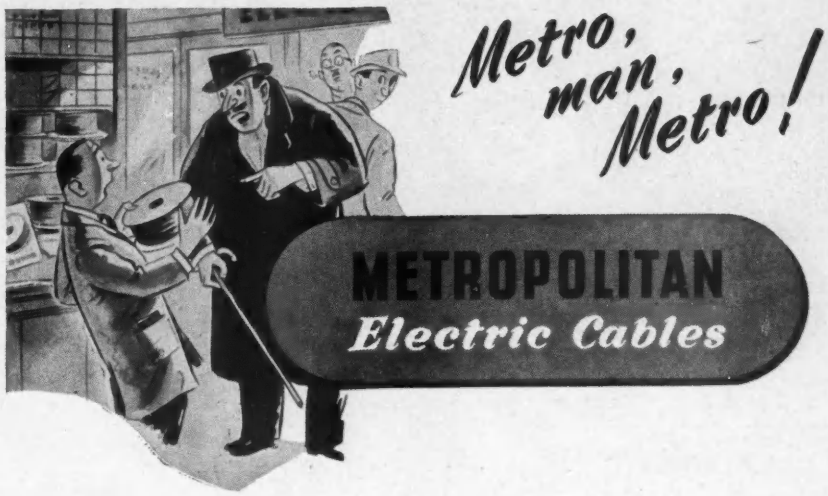

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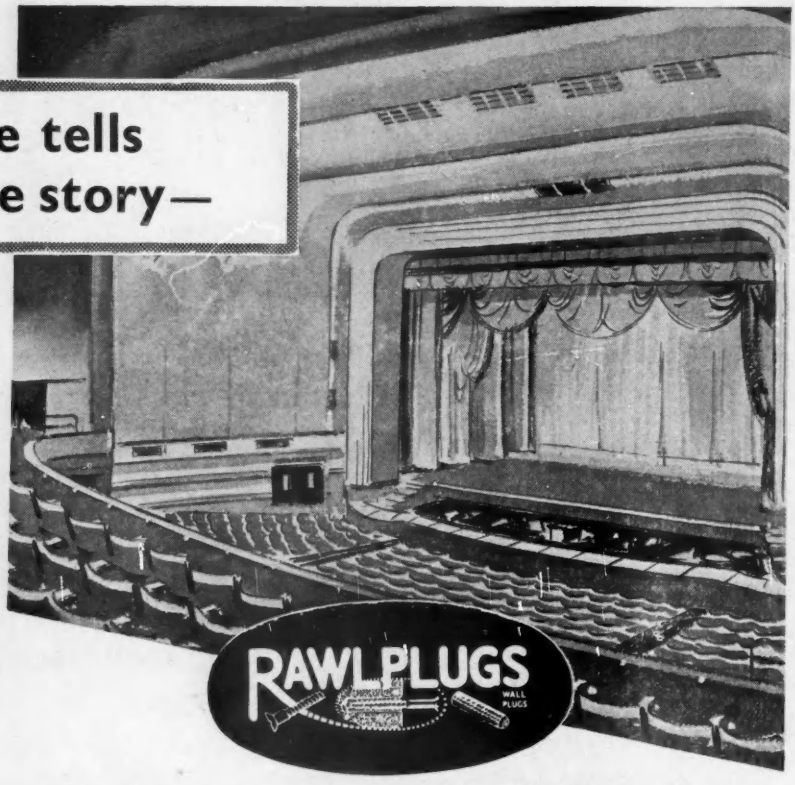

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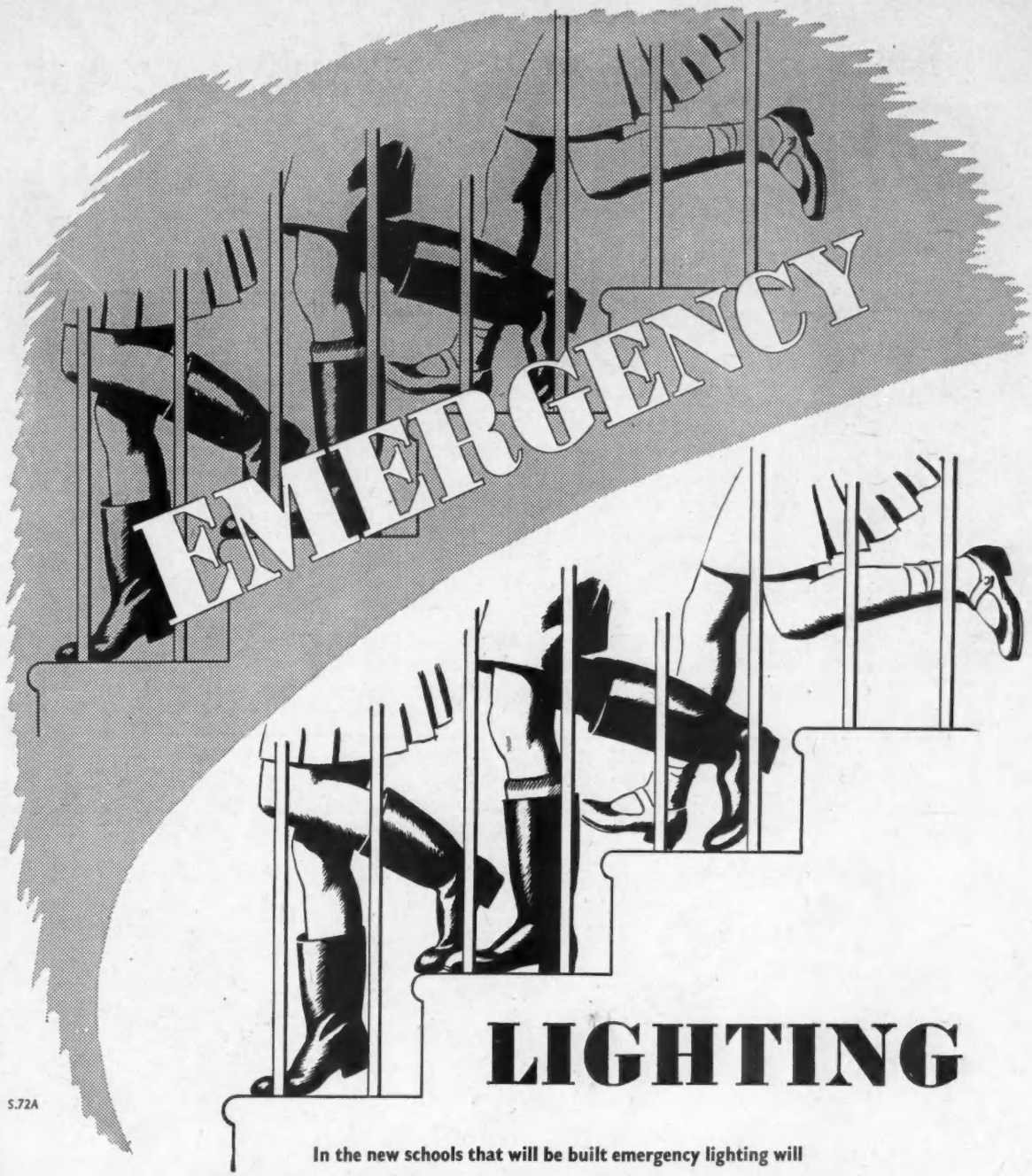

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S.72A

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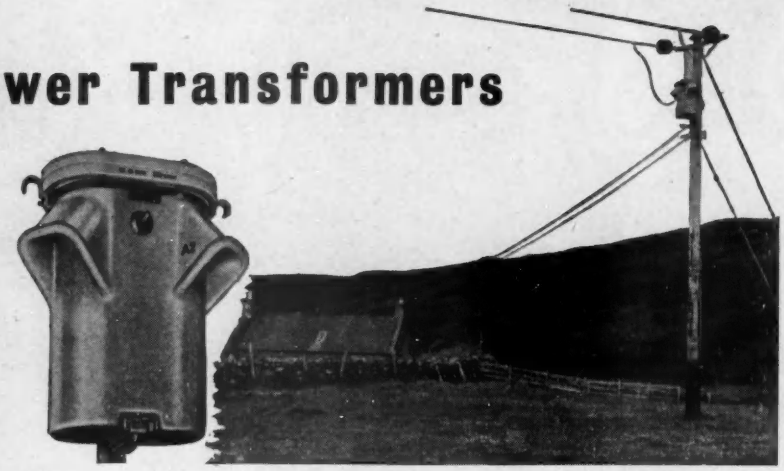

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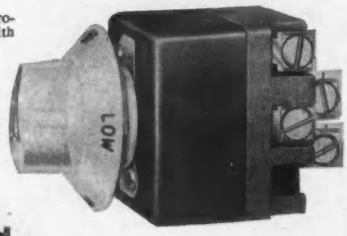

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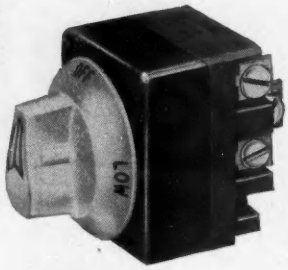

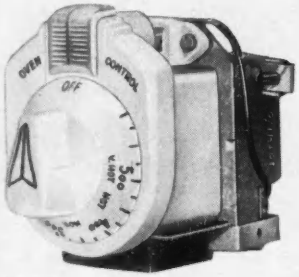

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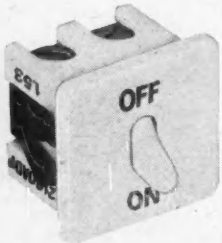

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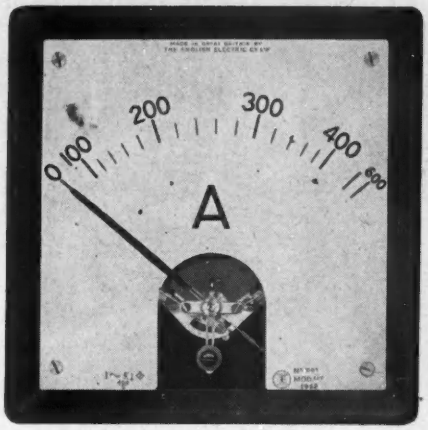

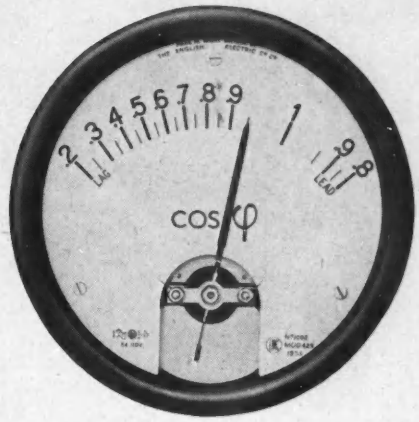

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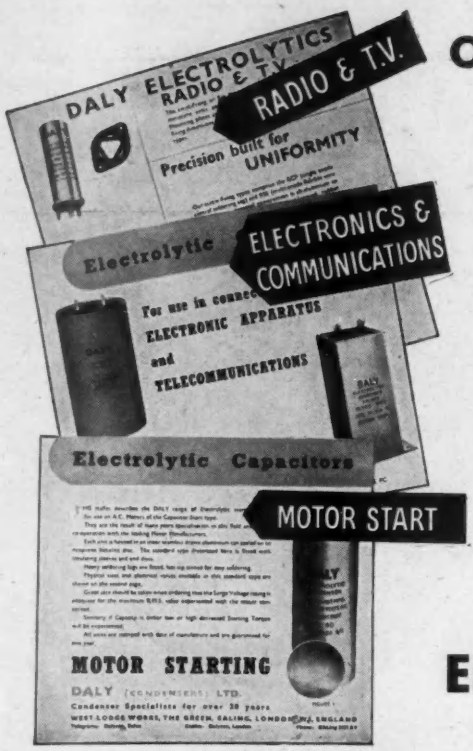

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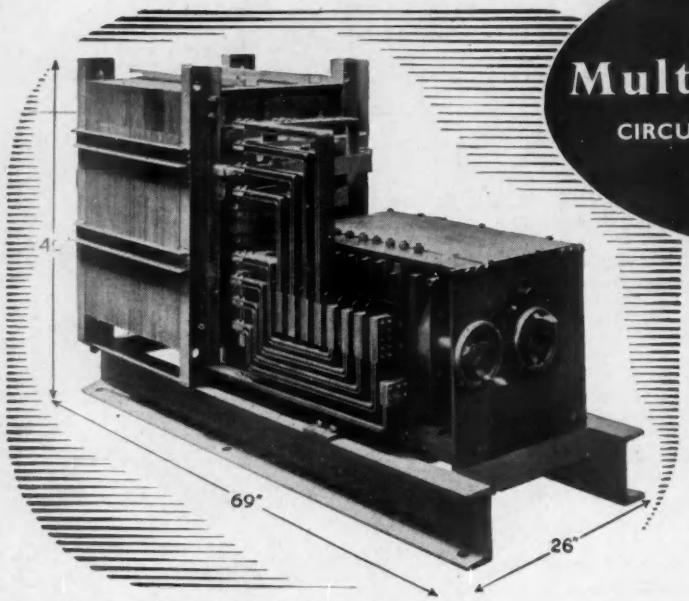

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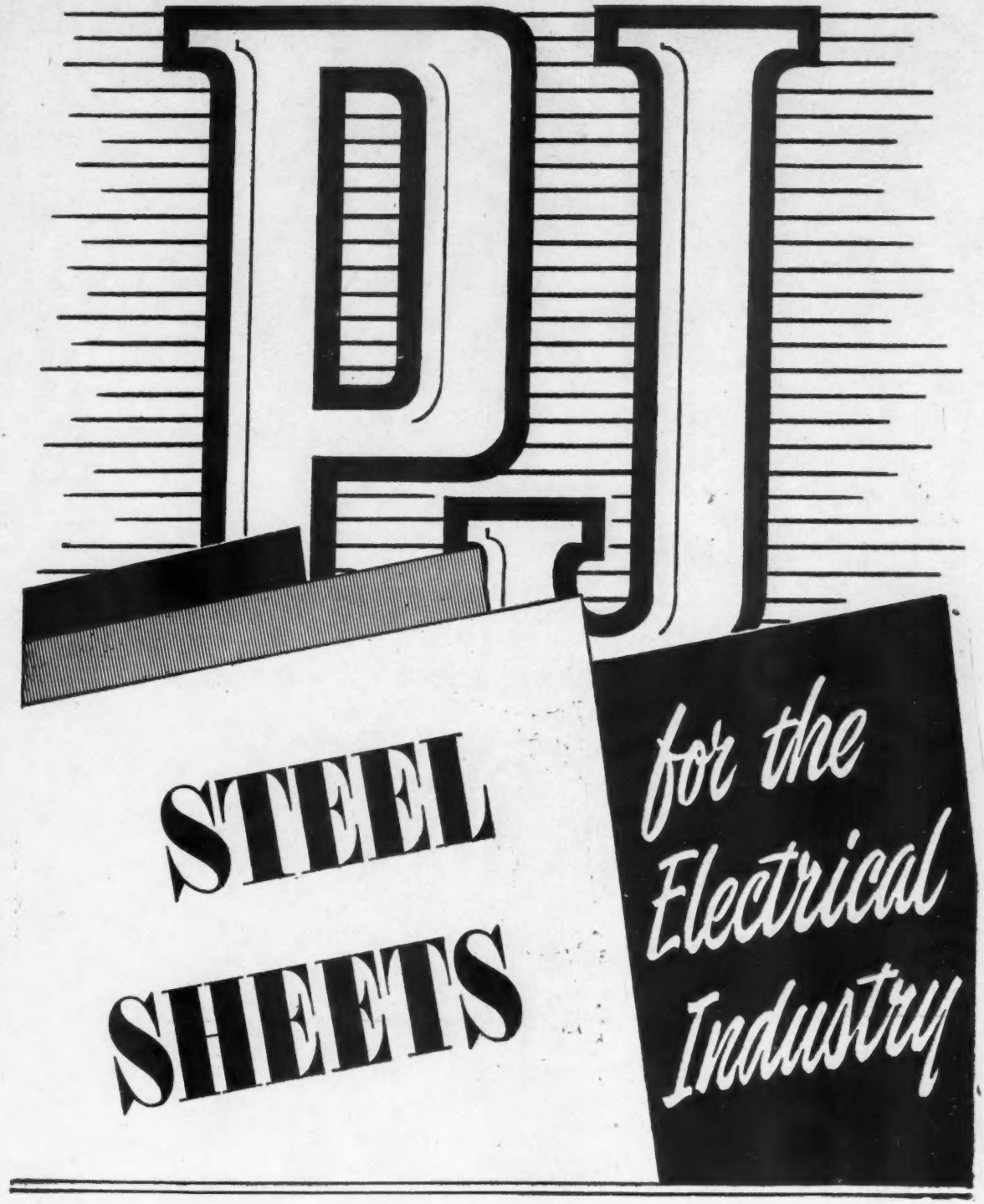

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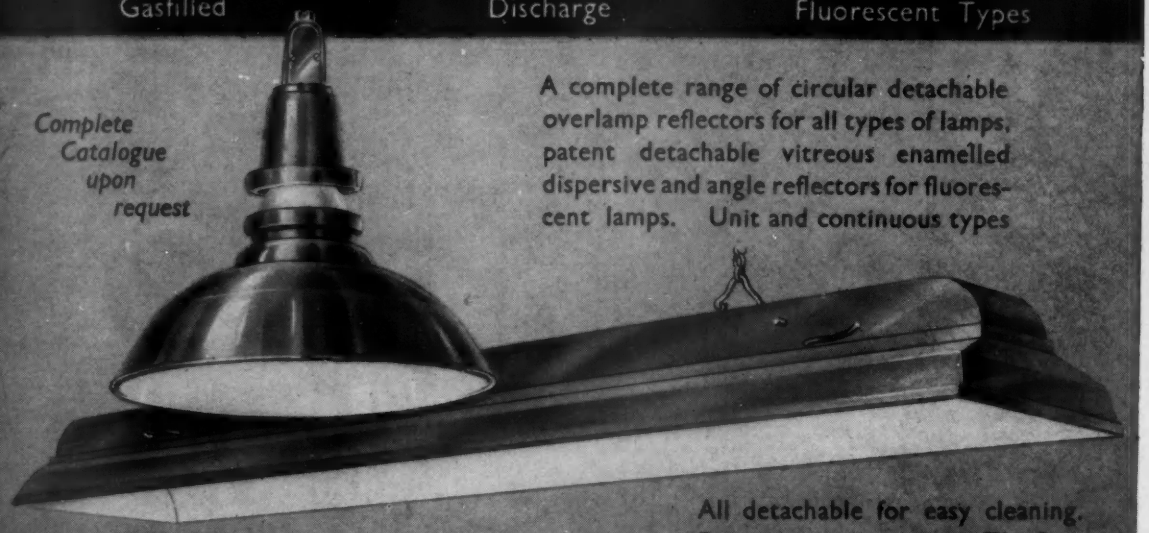

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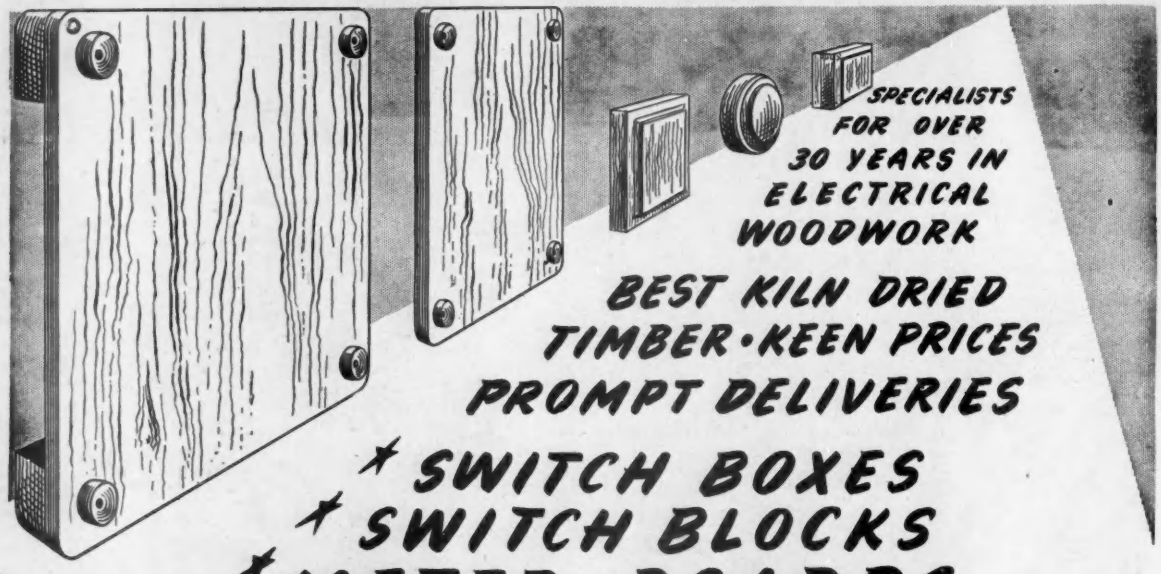

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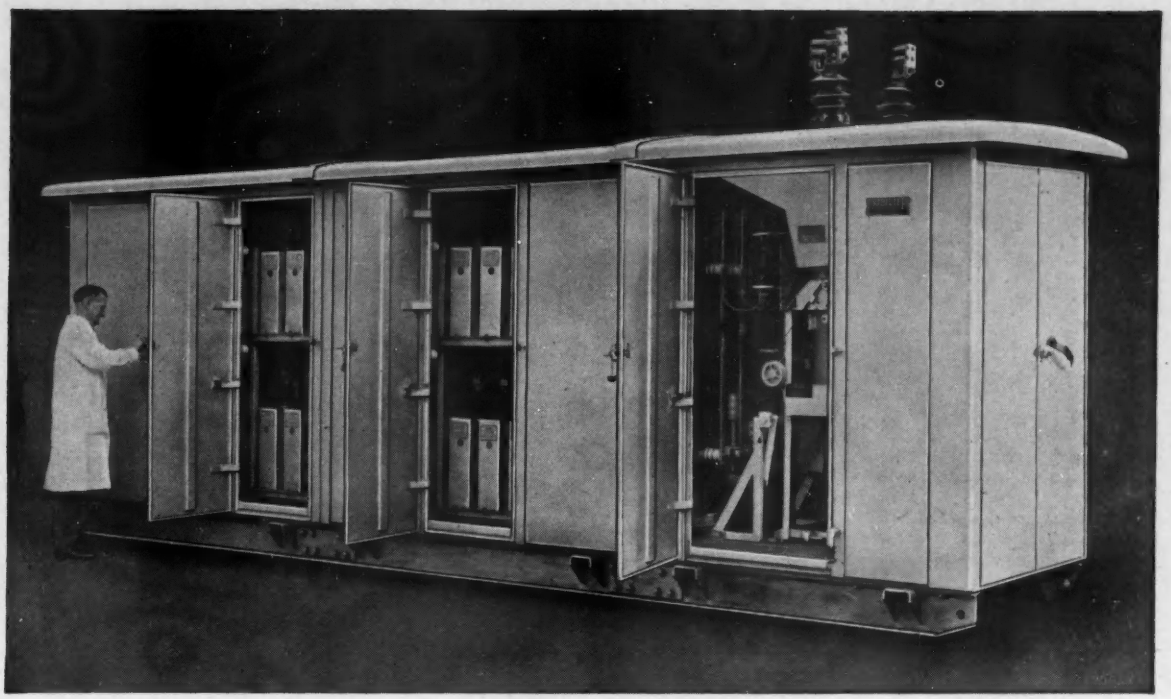

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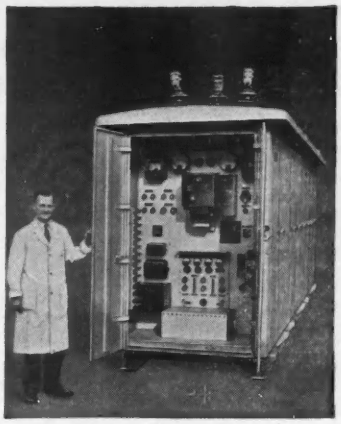

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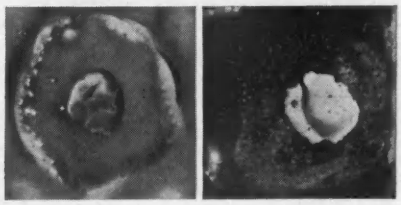

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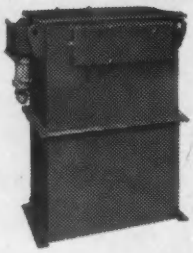

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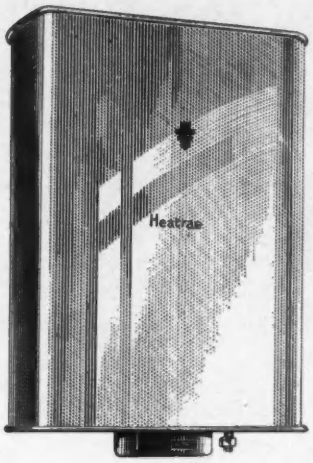

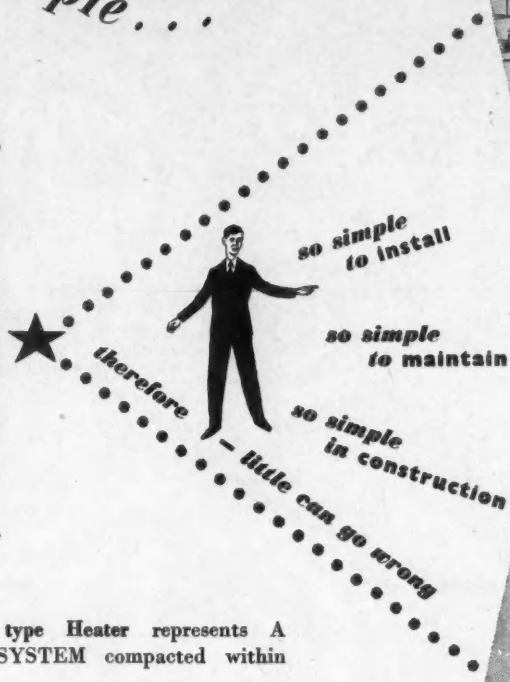

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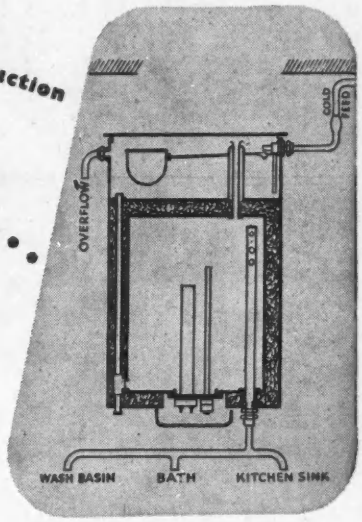

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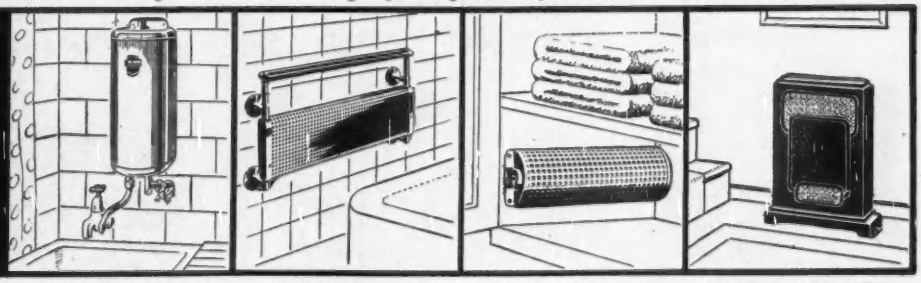

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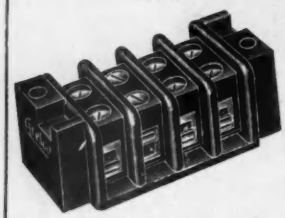

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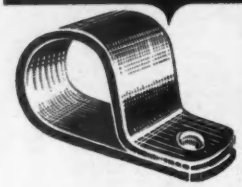

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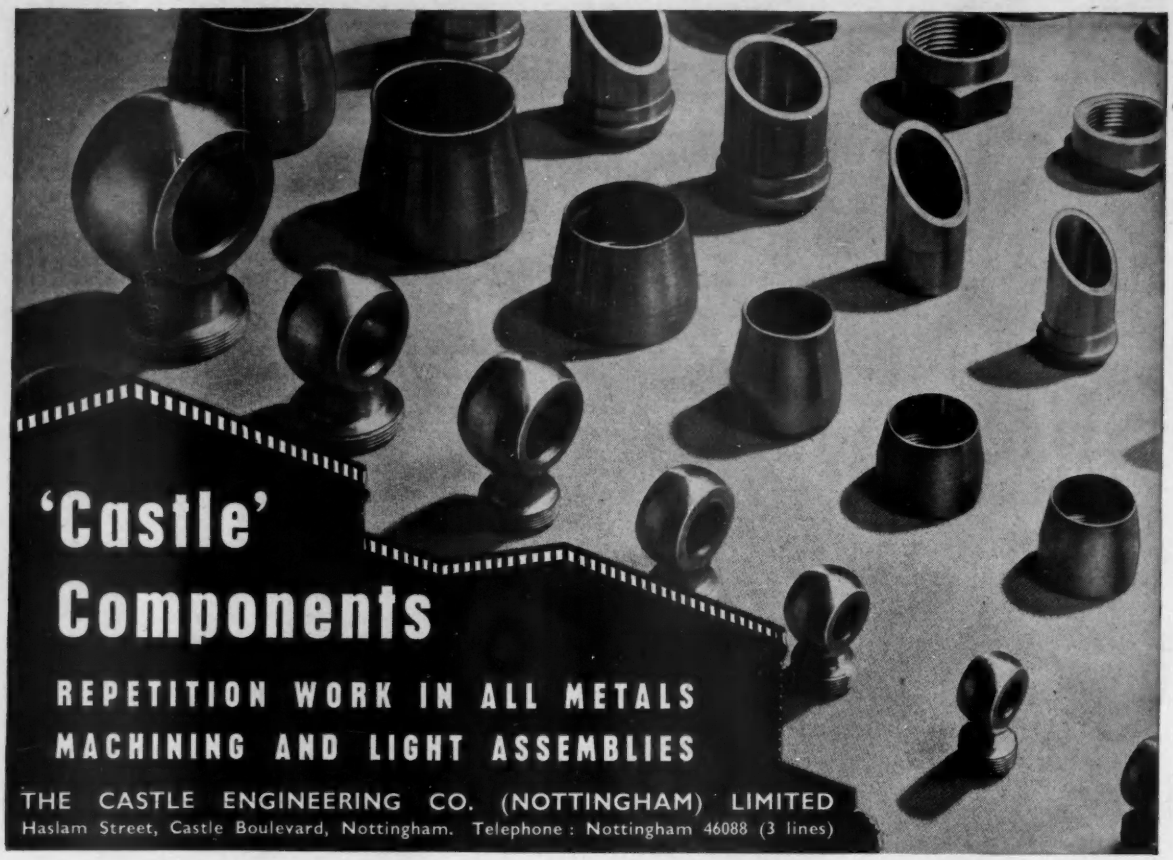
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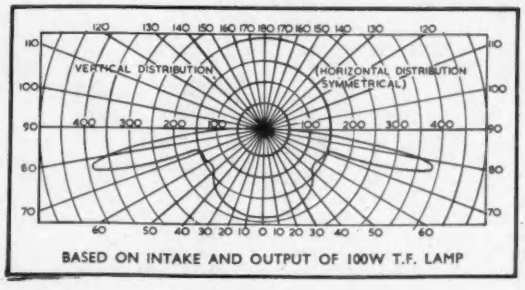

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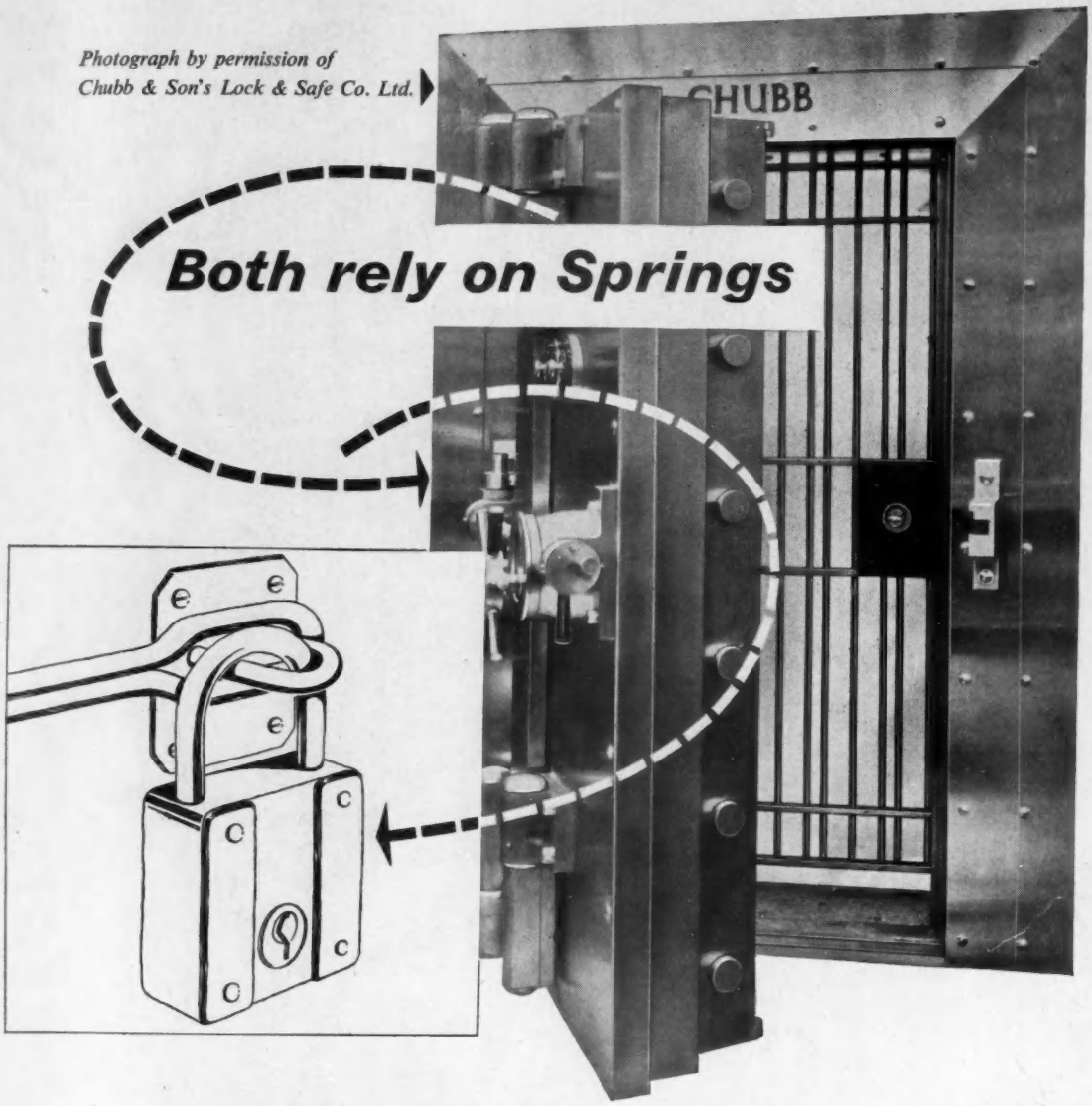

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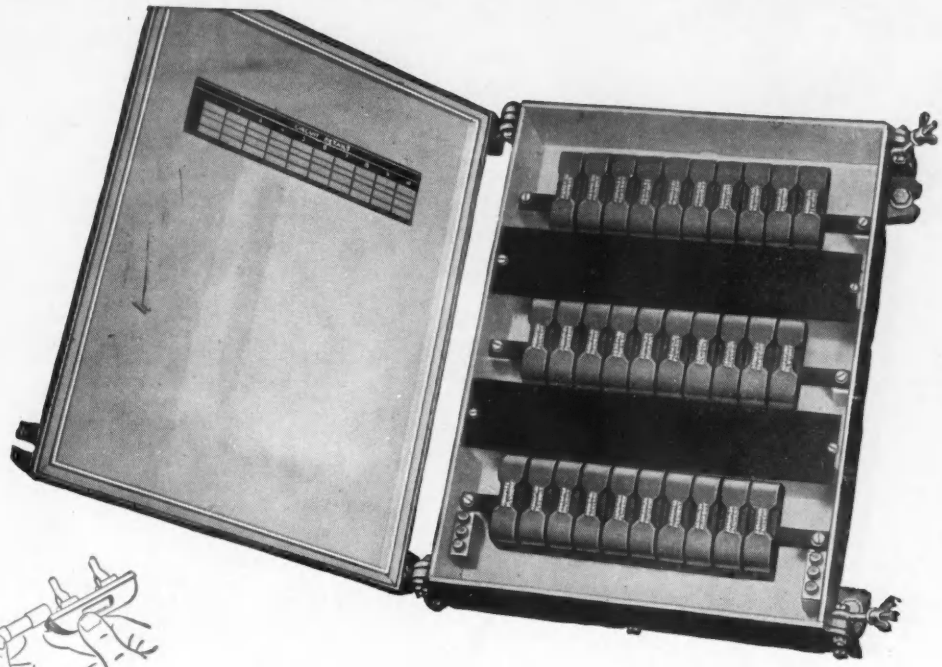

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